SIEMENS FM 738

MODEL

SERVICE MANUAL

Table of contents

Chapter 1 Technical data and features

Page

1-1 Front page
1-2 Table of contents
1-3 Survey of sets, features and PCBs
1-4 Remote control
1-5 Front/rear view of the set
Description of controls and terminal sockets
1-6/9 Technical specifications/Safety instructions

Chapter 2 Tools for error diagnosis

Page

2-1/3 Error diagnosis system
2-4/5 Servicing of SMDs
2-6/7 Dismantling of the set
2-8/19 Circuit descriptions

Chapter 3 Printed boards

Page

3-1/3 Adjustment procedures
3-4/6 Circuit diagram symbols
3-7 Wiring diagramm
3-8 Block diagram analog part
3-9 Block diagram digital part
3-10 *Power supply (PS)*
  PCB drawing
3-11 Circuit diagram
3-12/13 PCB drawing Family Board
3-14 *Tape deck sensor panel*
  Circuit diagram,PCB drawing
3-15 *Family Board*
  Deck electronics (DE) circuit diagram
3-16 Frontend (FE) circuit diagram
3-17 Teletext 'DOS' (OS) circuit diagram
3-19 Video/Chroma (VS) circuit diagram
3-20 FM-Sound (AF) circuit diagram
3-21 Audio linear (AL) circuit diagram
3-22 IN/OUT (IO) circuit diagram
3-23 *NICAM (NI)*
  Circuit diagram
  PCB drawing
3-24 *Head amplifier (HV/HA)*
  Circuit diagram
3-25 PCB drawing
3-26 *Keyboard Control Unit I (DC)*
  PCB drawing
3-27 Circuit diagram
Keyboard Control Unit III (DC)
  Circuit diagram,PCB drawing
3-28 *Keyboard Control Unit IIA - M8 (DC)*
  Circuit diagram,PCB drawing

Chapter 4 QSM-Plus Drive

Page

4-1 *Deck parts replacement*
  Auxiliary tools for deck adjustment
4-2 Deck layout diagrams
  Lift
4-3 Head disc
  A/C Head
  Threading motor
4-4 Capstan motor
  Pressure roller
  Roller unit right
  Roller unit left
4-5 Sensor print assy
Adjustments
  Tape path
  "Roller unit left; roller unit right"
  A/C Head
4-6 Horizontal distance
  Brake band
  Tape tension adjustment
  Friction clutch control
  Reverse brake control
4-7 *Exploded view*
4-8 Cleaning and lubrication

Cabinet and Frontpanel parts

4-9 Exploded view of cabinet parts
4-10 Exploded view of frontpanel parts

Survey of sets and PCBs

	Power Supply (PS)	***Family Board***	- Sequence Control (DE)	- Frontend (FE)	- Teletext"DOS" (OS)	- Video/Chroma (VS)	- FM-Sound (AF)	- Standard-Sound (AL)	- Input/Output (IO)	***Nicam***	***Head Amplifier***		***Keyboard Control Unit***						***Tape-deck***		
Page 3-	*11*		*15*	*16*	*17*	*19*	*20*	*21*	*22*	*23*	*24*	*24*	*27*	*27*	*27*	*28*	*28*	*27*			
		FM726/V6	FM727/V6	FM727/N6	FM728/V6						LHA 4/2/G	LHA 4/2/1	Control I FM726	Control I FM727	Control I FM728	Control II FM727	Control II FM728	Control III	WD-M-4/2K	WD-M-4/2SSK	WD-M-4/2/1SS
FM726/V6	●	●									●		●					●	●		
FM727/V6	●		●								●			●		●		●		●	
FM727/N6	●			●						●	●			●		●		●		●	
FM728/V6	●				●							●			●		●	●			●

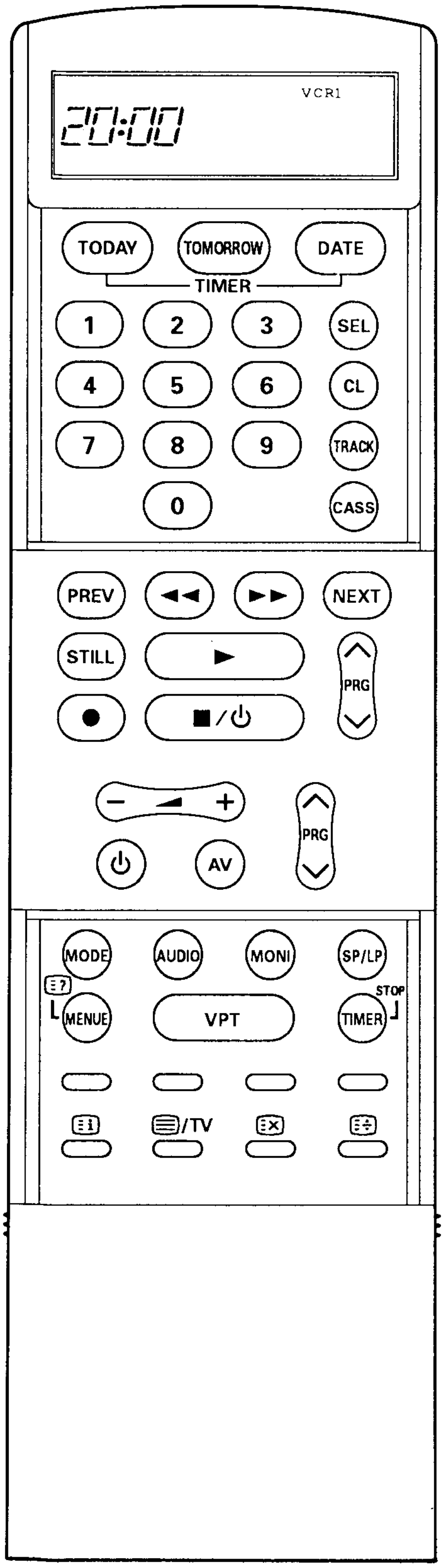
Survey of sets and features

	Video LP	FM-Audio	NICAM	German Stereo	Scart2 (decoder)	Test picture	VPT	Synchro Edit	Record prepared mode	Modulator ON/OFF	VPS	jog/shuttle	Tuner mode	View mode	monitor control	Flying erase head	Man. audio level control	Micro input, audio mix	Insert	Phones con.,cinch front	Simulcast, audio only	16:9 switching	audio dubbing
FM726/V6	●	●		●	●	●	●		●	●	●		●	●	●							●	
FM727/V6	●	●		●	●	●	●	●	●	●	●	●	●	●	●		●		●	●	●	●	●
FM727/N6	●	●	●	●	●	●		●	●	●	●	●	●	●	●		●		●	●	●	●	●
FM728/V6	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Buttons, controls and sockets

Here are all the buttons and sockets which you will find on your recorder and remote control.

The remote control


VCR1
20:00
TODAY
TOMORROW
DATE
TIMER
1
2
3
SEL
4
5
6
CL
7
8
9
TRACK
0
CASS
PREV
◀◀
▶▶
NEXT
STILL
▶
PRG
●
■/⏻
– ◢ +
PRG
⏻
AV
MODE
AUDIO
MONI
SP/LP
▤?
STOP
MENUE
VPT
TIMER
▤i
▤/TV
▤×
▤÷

TODAY	TIMER programming`"Today"
TOMORROW	TIMER programming "Tomorrow"
DATE	TIMER programming "later"
0-9	Digits buttons
SEL	Function selection
CL	Clear/Delete
TRACK	Auto tracking, Fine tuning
CASS	Tape length selection
PREV	VISS function "previous"
◀◀	Rewind/Picture search reverse
▶▶	Wind/Picture search forward
NEXT	VISS function "next"
STILL	Still picture
▶	Playback
∧PRG∨	
●	
■/⏻	Stop/Standby
MODE	Record selection
AUDIO	Audio select
MONI	TV monitor function
SP/LP	Standardplay/Longplay
MENUE / ?	Menu Button/TXT- hidden information
VPT	TXT-programming (VPT)
TIMER / STOP	TIMER-Programming on thr remote control/TXT page hold
⬭	TXT-special buttons: RED, GREEN, YELLOW, BLUE
▤i	TXT-table of contents
▤/TV	TXT on/off
▤×	TXT off (temporary)
▤÷	TXT-enlarged character size

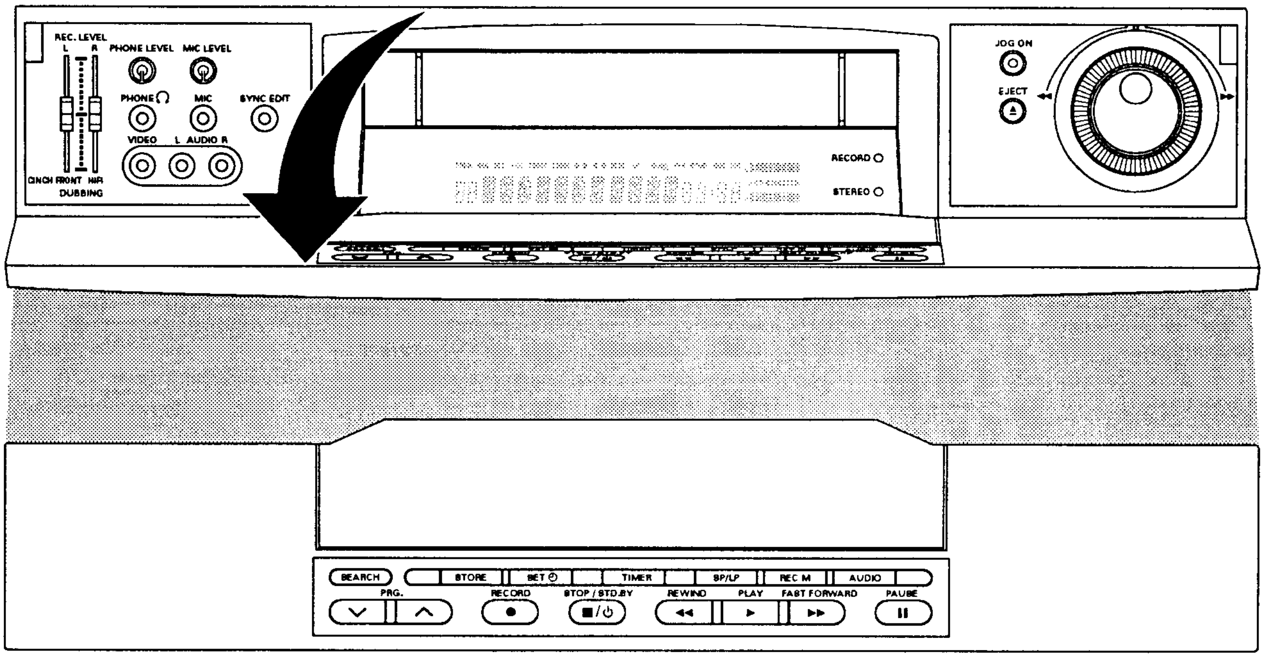
Additional TV functions
(only for TV sets with remote control code):

∧PRG∨	TV Presets –/+
AV	TV-Preset AV
- ◢ +	TV-Volume –/+
⏻	TV off

The front of the video recorder

REC LEVEL	Recording sound level control
PHONE LEVEL	Headphones volume adjustment
PHONE	Headphones socket
MIC LEVEL	Microphone recording level control
MIC	Microphone socket
SYNC EDIT	Synchronization edit socket
VIDEO	Video input socket
L AUDIO R	Audio input sockets

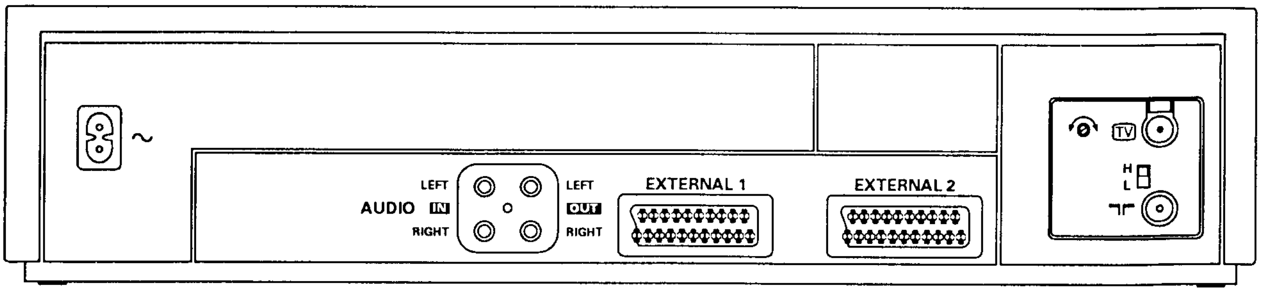
JOG ON	Single picture /Picture search on/off
○	Single picture /Picture search button (JOG/SHUTTLE)
EJECT ≜	Cassette eject


REC. LEVEL
L
R
PHONE LEVEL
MIC LEVEL
PHONE
MIC
SYNC EDIT
VIDEO
L AUDIO R
CINCH FRONT HIFI
DUBBING
RECORD
STEREO
JOG ON
EJECT
SEARCH
STORE
SET
TIMER
SP/LP
REC M
AUDIO
PRG.
RECORD
STOP / STD.BY
REWIND
PLAY
FAST FORWARD
PAUSE

SEARCH	Station search button
STORE	Stion store button
SET ⊙	Set clock
TIMER	TIMER programming
SP/LP	Standartplay/Longplay
REC M	Recording mode
AUDIO	Audio selection
STOP+EJECT	(app.5sec simultaneously): Modulator ON/OFF

∨PRG∧	VCR programme minus/plus
RECORD ●	Recording/OTR
STOP/STD BY ■/⏻	Stop /Stand By
REWIND ◀◀	Rewind Picture search reverse
PLAY ▶	Playback
FAST FORWARD ▶▶	Wind Picture search forward
PAUSE	Pause/Still picture

The back of the video recorder


~
LEFT
AUDIO IN
RIGHT
LEFT
OUT
RIGHT
EXTERNAL 1
EXTERNAL 2
TV
H
L

~	Mains socket
x	Aerial output socket
-II-	Aerial input socket
EXTERNAL 1	AV-Euroconnection 1 (Scart)
EXTERNAL 2	AV-Euroconnection 2 (Scart)
⊘	Channel control

L/H	Attenuator switch
AUDIO IN RIGHT	Audio input, right channel
AUDIO IN LEFT	Audio input, left channel
AUDIO OUT RIGHT	Audio output, right channel
AUDIO OUT LEFT	Audio output, left channel

Technical data	Technische Daten	Caracteristiques	
Mains voltage	Netzspannung	Tension secteur	180 - 240 V
Mains frequency	Netzfrequenz	Fréquence	47 - 63 Hz
Power consumption	Leistungsaufnahme	Puissance absorbée	24 W
Power consumption	Leistungsaufnahme	Puissance absorbée	18 W (stand by)
Ambient temperature	Raumtemperatur	Température ambiante	+10°C - +35°C
Relative humidity	Relative Luftfeuchtigkeit	Humidité relative	20 - 80%
Dimensions	Abmessungen	Encombrement	435 x 96 x 386 mm
Weight	Gewicht	Poids	~ 5,2 kg
Fast forward/rewind time	Vor-/Rückspulzeit	Temps (re-)bobinage	typ. 95s (E180 cass.)
Position of use	Betriebslage	Position d'emploi	horizontally, max 15°
Video-resolution	Video-Auflösung	Puissance absorbée	>240 lines
Audio	Audio	Audio	80Hz - 10kHz (≤8dB) 80Hz - 5kHz (≤8dB) LP
FM Audio	FM Audio	FM Audio	20Hz - 20kHz (≤3dB) SP

Technische gegevens	Datos tecnicos	Dati tecnici	
Netspanning	Tensión de red	Tensione di alimentazione	180 - 240 V
Netfrequentie	Frecuencia de red	Frequenza di rete	47 - 63 Hz
Opgenomen vermogen	Consumo de potencia	Potenza assorbita	24 W
Opgenomen vermogen	Consumo de potencia	Potenza assorbita	18 W (stand by)
Omgevingstemperatuur	Temperatura ambiente	Temperatura ambiente	+10°C - +35°C
Relatieve vochtigheid	Humedad relativa	Umiditá relativa	20 - 80%
Afmetingen	Dimensiones	Dimensioni	435 x 96 x 386 mm
Gewicht	Peso	Peso	~ 5,2 kg
Vooruit/terugspoeltijd	tiempo de (re-)bobinado	Tempo di (ri-)avvolgimento	typ. 95s (E180 cass.)
Gebruikspositie	Posición de uso	Posizione di funzionamento	horizontally, max 15°
Oplossend vermogen	Resolución video	Risoluzione video	>240 lines
Audio	Audio	Audio	80Hz - 10kHz (≤8dB) 80Hz - 5kHz (≤8dB) LP
FM Audio	FM Audio	FM Audio	20Hz - 20kHz (≤3dB) SP

Sicherheitsvorschriften / Safety requirements / Prescrizioni de sicurezza / Prescriptions de sécurité / Prescripciones de seguridad

D

Achtung: Bei Eingriffen ins Gerät sind die Sicherheitsvorschriften nach VDE 701 (reparaturbezogen) bzw. VDE 0860 / IEC 65 (gerätebezogen) zu beachten!

Bauteile nach IEC- bzw. VDE-Richtlinien ! Im Ersatzfall nur Teile mit gleicher Spezifikation verwenden!

MOS - Vorschriften beim Umgang mit MOS - Bauteilen beachten!

GB

Attention: Please observe the applicable safety requirements according to VDE 701 (concerning repairs) and VDE 0860 / IEC 65 (concerning type of product)!

Components to IEC or VDE guidelines! Only use components with the same specifications for replacement!

Observe **MOS** components handling instructions when servicing!

I

Attenzione: Osservarne le corrispondenti prescrizioni di sicurezza VDE 701 (concernente servizio) e VDE 0860 / IEC 65 (concernente il tipo di prodotto)!

Componenti secondo le norme VDE risp. te IEC! In caso di sostituzione impiegare solo componenti con le stesse caratteristiche.

Osservare le relative prescrizioni durante, lavori con componenti **MOS**!

F

Attention:
Prière d'observer les prescriptions de sécurité VDE 701 (concernant les réparations) et VDE 0860 / IEC 65 (concernant le type de produit)!

Composants répondant aux normes VDE ou IEC. Les remplacer uniquement par des composants ayant les mêmes spécifications.

Lors de la manipulation des circuits **MOS**, respecter les pescriptions **MOS**!

E

Atención: Recomendamos las normas de seguridad VDE u otras normas equivalentes, por ejemplo: VDE 701 para reparaciones, VDE 0860 / IEC 65 para aparatos!

Componentes que cumplen las normas VDE/IEC. En caso de sustitución, emplear componentes con idénticas especificaciones!

Durante la reparacion observar las normas sobre componentes **MOS**!

USA
U.S. & Canada

Attention: Because of autovoltage facility this set can be operated from AC mains from 180 - 240 V, 50/60 Hz. Also observe the information given on the rear of the set.
CAUTION-for continued protection against risk of fire replace only with same type of fuses!
CAUTION: to reduce the risk of electric shock, do not remove cover (or back), no user-serviceable parts inside, refer servicing to qualified service personnel.

Components to safety guidelines (IEC/U.L.)! Only use com-ponents with the same specifications for replacement!
By checking the leakage current and insulation resistance ensure that the exposed parts are acceptably insulated from the supply circuit.

Observe **MOS** components handling instructions when servicing!

(D) Sicherheitsbestimmungen **(GB) Safety Standard Compliance** **(I) Norme di sicurezza**
(F) Prescriptions de sécurité **(E) Disposiciones para la seguridad** **(USA) Safety Instructions**

(D) Sicherheitsbestimmungen

Nach Servicearbeiten ist bei Geräten der Schutzklasse II die Messung des Isolationswiderstandes und des Ableitstromes bei eingeschaltetem Gerät nach **VDE 0701 / Teil 200** bzw. der am Aufstellort geltenden Vorschrift, durchzuführen!
Dieses Gerät entspricht der Schutzklasse II, erkennbar durch das Symbol ⧈ .

- **Messen des Isolationswiderstandes nach VDE 0701.**
  Isolationsmesser (U_{Test} = 500 V-) gleichzeitig an beiden Netzpolen und zwischen allen Gehäuse- oder Funktionsteilen (Antenne, Buchsen, Tasten, Zierteilen, Schrauben, usw.) aus Metall oder Metallegierungen anlegen. Fehlerfrei ist das Gerät bei einem:
  $R_{Isol} \geq 2\ M\Omega$ bei U_{Test} = 500 V-
  Meßzeit: ≥ 1 s (Fig. 1)

Anmerkung: Bei Geräten der Schutzklasse II kann durch Entladungswiderstände der Meßwert des Isolationswiderstandes konstruktionsbedingt < 2 MΩ sein. In diesen Fällen ist die Ableitstrommessung maßgebend.

- **Messen des Ableitstromes nach VDE 0701.**
  Ableitstrommesser (U_{Test} =220 V≈) gleichzeitig an beiden Netzpolen und zwischen allen Gehäuse- oder Funktionsteilen (Antenne, Buchsen, Tasten, Zierteilen, Schrauben, usw.) aus Metall oder Metallegierungen anlegen. Fehlerfrei ist das Gerät bei einem:
  $I_{Ableit} \leq 1$ mA bei U_{Test} = 220V ≈ / Meßzeit ≥ 1 s (Fig. 2)
- Wir empfehlen die Messungen mit dem **METRATESTER 3** durchzuführen. (Meßgerät zur Prüfung elektrischer Geräte nach VDE 0701).

  Metrawatt GmbH
  Geschäftsstelle Bayern
  Triebstr. 44
  D 8000 München 50
- Ist die Sicherheit des Gerätes nicht gegeben, weil
  - eine Instandsetzung unmöglich ist,
  - oder der Wunsch des Benützers besteht, die Instandsetzung nicht durchführen zu lassen, so muß dem Betreiber die vom Gerät ausgehende Gefahr schriftlich mitgeteilt werden.

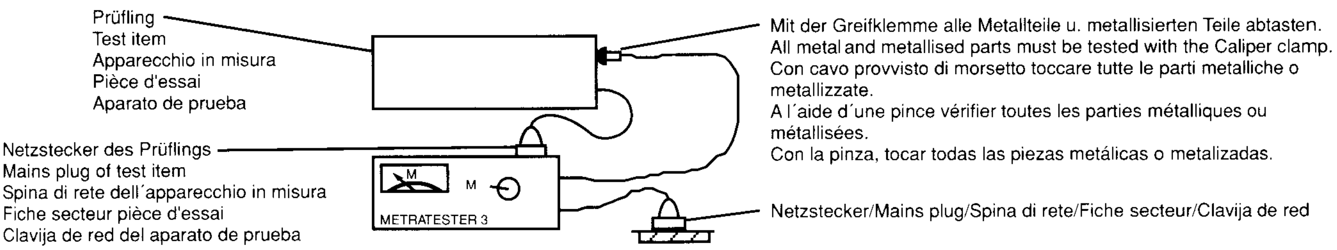

Prüfling
Test item
Apparecchio in misura
Pièce d'essai
Aparato de prueba
Netzstecker des Prüflings
Mains plug of test item
Spina di rete dell'apparecchio in misura
Fiche secteur pièce d'essai
Clavija de red del aparato de prueba
M
M
METRATESTER 3
Mit der Greifklemme alle Metallteile u. metallisierten Teile abtasten.
All metal and metallised parts must be tested with the Caliper clamp.
Con cavo provvisto di morsetto toccare tutte le parti metalliche o metallizzate.
A l'aide d'une pince vérifier toutes les parties métalliques ou métallisées.
Con la pinza, tocar todas las piezas metálicas o metalizadas.
Netzstecker/Mains plug/Spina di rete/Fiche secteur/Clavija de red

Fig. 1

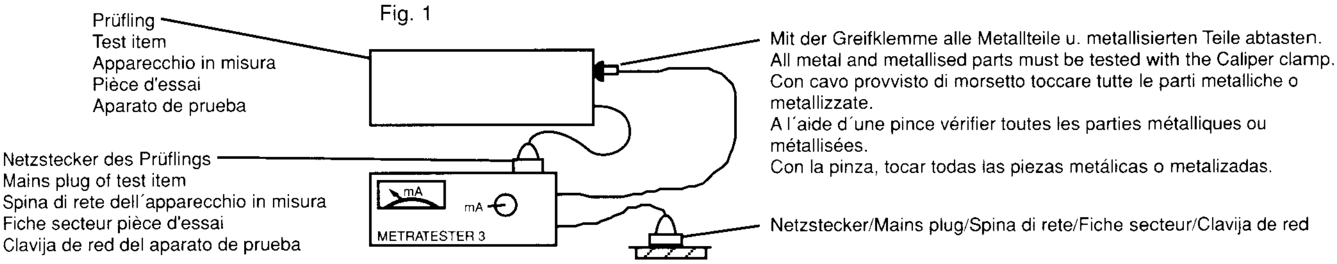

Prüfling
Test item
Apparecchio in misura
Pièce d'essai
Aparato de prueba
Netzstecker des Prüflings
Mains plug of test item
Spina di rete dell'apparecchio in misura
Fiche secteur pièce d'essai
Clavija de red del aparato de prueba
mA
mA
METRATESTER 3
Mit der Greifklemme alle Metallteile u. metallisierten Teile abtasten.
All metal and metallised parts must be tested with the Caliper clamp.
Con cavo provvisto di morsetto toccare tutte le parti metalliche o metallizzate.
A l'aide d'une pince vérifier toutes les parties métalliques ou métallisées.
Con la pinza, tocar todas las piezas metálicas o metalizadas.
Netzstecker/Mains plug/Spina di rete/Fiche secteur/Clavija de red

Fig. 2

Empfehlungen für den Servicefall

- Nur Original - Ersatzteile verwenden.
  Bei Bauteilen oder Baugruppen mit der Sicherheitskennzeichnung ⚠ sind Original - Ersatzteile zwingend notwendig.
- Auf Sollwert der Sicherungen achten.
  Zur Sicherheit beitragende Teile des Gerätes dürfen weder beschädigt noch offensichtlich ungeeignet sein.
- Dies gilt besonders für Isolierungen und Isolierteile.
- Netzleitungen und Anschlußleitungen sind auf äußere Mängel vor dem Anschluß zu prüfen. Isolation prüfen!
- Die Funktionssicherheit der Zugentlastung und von Biegeschutz-Tüllen ist zu prüfen.
- Thermisch belastete Lötstellen absaugen und neu löten.
- Belüftungen frei lassen.

(GB) Safety Standard Compliance

After service work on a product conforming to the Safety Class II, the insulating resistance and the leakage current with the product switched on must be checked according to VDE 0701 or to the specification valid at the installation location!
This product conforms to the Safety Class II, as identified by the symbol ⧈ .

- **Measurement of the Insulation Resistance to VDE 0701,**
  Connect an Insulation Meter (U_{Test} = 500 V-) to both mains poles simultaneously and between all cabinet or functional parts (antenna, sockets, buttons, decorative parts, etc.) made from metal or metal alloy. The product is fault free if:
  $R_{Isol} \geq 2\ M\Omega$ at U_{Test} = 500 V-
  Measuring time: $\geq$ 1s, (Fig. 1)

Comment: On products conforming to the Safety Class II the Insulation Resistance can be < 2 MΩ, dependent contructively on discharge resistors. In this case, the check of the leakage current is significant.

- **Measurement of the Leakage Current to VDE 0701.**
  Connect the Leakage Current Meter (U_{Test} = 220 V≈) to both mains poles simultaneously and between all cabinet or functional parts (antenna, sockets, buttons, screws, etc.) made from metal or metal alloy. The product is fault free if:
  $I_{Leak} \leq 1$ mA at U_{Test} = 220 V ≈
  Measuring time: $\geq$ 1 s, (Fig. 2)
- We recommend that the measurements be carried out using the **METRATESTER 3**. (Test equipment for checking electrical products to VDE 0701).

  Metrawatt GmbH
  Geschäftsstelle Bayern
  Triebstr. 44
  D 8000 München 50
- If the safety of the product is not proved, because
  - a repair and restoration is impossible
  - or the request of the user is that the restoration is not to be carried out, the operator of the product must be warned of the danger by a written warning.

Recommendation for service repairs

- With components or assemblies accompanied with the Safety Symbol ⚠ only original spare parts are strictly to be used.
- Use only original fuse value.
- Parts contributing to the safety of the product must not be damaged or obviously unsuitable. This is valid especially for insulators and insulating parts.
- Mains leads and connecting leads should be checked for external damage before connection. Check the insulation!
- The tension relief and bending protection bushes are to be checked for their functional safety.
- Thermally loaded solder pads are to be sucked off and re-soldered. Ensure that the ventilation slots are not obstructed.

Ⓘ Norme di sicurezza

Successivamente ai lavori di riparazione, negli apparecchi della classe di protezione II occorre effettuare la misura della resistenza di isolamento e della corrente di dispersione quando l'apparecchio e'acceso, secondo le norme VDE 0701 / parte 200 e rispettivamente le norme locali!
Questo apparecchio corrisponde alla classe di protezione II ed è riconoscibile dal simbolo ⧈.

- **Misura della resistenza di isolamento secondo VDE 0701**
  Applicare il misuratore di isolamento (tens.$_{prova}$ = 500 V-) contemporaneamente ai due poli di rete e tra tutte le parti del mobile e delle funzioni (antenna, prese, tasti, mascherine, viti ecc.) in metallo o in lega metallica. L'apparecchio non presenta difetti quando:
  $R_{isol} \geq 2$ MΩ con tens.$_{prova}$ = 500 V-
  Tempo di misura: ≥ 1s (Fig. 1).

Nota: Negli apparecchi della classe II, che per motivi costruttivi dispongono di resistenze di dispersione, il valore di misura della resistenza di isolamento può essere inferiore a < 2 MΩ.
In questi casi è determinante la misura della corrente di dispersione.

- **Misura della corrente di dispersione secondo VDE 0701**
  Applicare il misuratore di isolamento (tens.$_{prova}$ = 220 V≈) contemporaneamente ai due poli di rete e tra tutte le parti del mobile e delle funzioni (antenna, prese, tasti, mascherine, viti ecc.) in metallo o in lega matallica. L'apparecchio non presenta difetti quando:
  $I_{disp.} \leq 1$ mA con tens.$_{prova}$ = 220 V≈
  Tempo di misura : ≥ 1 s (Fig. 2)
- Si raccomanda di effettuare le misure con lo strumento **METRATESTER 3** (strumento di misura per il controllo di apparecchi elettrici secondo VDE 0701).

  Metrawatt GmbH
  Geschäftsstelle Bayern
  Triebstr. 44
  D 8000 München 50
- Se la sicurezza dell'apparecchio non è raggiunta, perchè
  - una riparazione non è possibile
  - oppure è desiderio del cliente che una riparaz. non avvenga in questi casi si deve comunicare per iscritto all'utilizzat. la pericolosità dell'apparecchio riguardo il suo isolamento.

Raccomandazione per il servizio assistenza

- Impiegare solo componenti originali:
  I componenti o i gruppi di componenti contraddistinti dall' indicaz. ⚠ devono assolutamente venir sostituiti con parti originale.
- Osservare il valore nominale dei fusibili.
  I componenti che concorrono alla sicurezza dell´apparecchio non possono essere nè danneggiati nè risultare visibilmente inadatti. Questo vale soprattutto per isolamenti e parti isolate.
- I cavi di rete e di collegamento vanno controllati prima dell'utilizzo affinchè non presentino imperfezioni esteriori. Controllare l'isolamento.
- E´necessario controllare la sicurezza dei fermacavi e delle guaine flessibili.
- Saldature caricate termicam. vanno rifatte.
- Lasciare libere le fessure di areazione.

Ⓕ Prescriptions de sécurité

Suite aux travaux de maintenance sur les appareils de la classe II, il convient de mesurer la résistance d'isolement et le courant de fuite sur l'appareil en état de marche, conformément à la norme VDE 0701 § 200, ou selon les prescriptions en vigueur sur le lieu de fonctionnement de l'appareil!
Cet appareil est conforme aux prescriptions de sécurité classe II, signalé par le symbole ⧈.

- **Mesure de la résistance d'isolement selon VDE 0701**
  Brancher un appareil de mesure d'isolation (U_{test} = 500 V-) simultanément sur les deux pôles secteur et entre toutes les parties métalliques ou métallisées accessibles de l'appareil (antenne, embases, touches, enjoliveurs, vis, etc.).
  Le fonctionnement est correct lorsque:
  $R_{isol} \geq 2$ MΩ pour une U_{test} = 500 V-
  Durée de la mesure: ≥ 1s

Observations: L'isolation des appareils de la classe II, de part leur conception (résistances de décharge), peut être inférieure à 2 MΩ, (Fig. 1).

- **Mesure du courant de fuite selon VDE 0701**
  Brancher un ampèremètre du courant de fuite (U_{test} = 220V≈) simultanément sur les deux pôles du secteur et entre toutes les parties métalliques ou métallisées accessibles de l'appareil (antenne, embases, touches, enjoliveurs, vis, etc.). Le fonctionnement est correct lorsque (Fig. 2):
  $I_{fuite} \leq 1$ mA pour U_{test} = 220 V≈
  Durée de la mesure: ≥ 1 s.

Pour ces mesures, nous préconisons l´utilisation du **METRATESTER 3** (instrument de mesure pour le contrôle d'appareils électriques conformes à la norme VDE 0701).

Metrawatt GmbH
Geschäftsstelle Bayern
Triebstr. 44
D 8000 München 50

- Dans le cas où la sécurité de l'appareil n´est pas assurée pour les raisons suivantes:
  - la remise en état est impossible
  - l'utilisateur ne souhaîte pas la remise en état de l'appareil, l'utilisateur doit être informé par écrit du danger que représente l'utilisation de l'appareil.

Recommandations pour la maintenance

- Utiliser exclusivement des pièces de rechange d'origine. Les composants et ensembles de composants signalés par le symbole ⚠
- doivent être impérativement remplacés par des pièces d'origine.
- Respecter la valeur nominale des fusibles.
- Veiller au bon état et la conformité des pièces contribuant à la sécurité de fonctionnement de l'appareil. Ceci s'applique particulièrement aux isolements et pièces isolantes.
- Vérifier le bon état extérieur des câbles secteur et des câbles de raccordement au point de vue isolement avant la mise sous tension.
- Vérifier le bon état des protections de gaine.
- Nettoyer les soudures avant de les renouveler.
- Dégager les voies d'aération.

(E) Disposiciones para la seguridad

Después de operaciones de servicio en aparatos de la clase de proteccion II, se llevará a cabo la medida de la resistencia de aislamiento y de la corriente derivada, con el aparato conectado, de acuerdo con VDE 0701 o de las disposiciones vigentes en el lugar de instalación .
Este aparato corresponde a la clase de protección II, reconocible por el sìmbolo ⧈.

- **Medida de la resistencia de aislamiento según VDE 0701.**
  Aplicar el medidor de aislamiento (U_{prueba} = 500 V-), simultáneamente, a los dos polos de red y entre todas las partes del mueble o de funciones (antena, conectores, teclas, tornillos, etc.) de metal o aleaciones metálicas. El aparato estará libre de defectos con:
  $R_{aisl} \geq 2\ M\Omega$ con U_{prueba} = 500 V-
  Tiempo de medida: ≥ 1 seg.

Observación: En aparatos de la clase de protecciòn II, condicionado por la construcción y por resistencias de descarga, el valor de medida de la resistencia de aislamiento puede ser inferior a $< 2\ M\Omega$.
En este caso es decisiva la medida de la corriente derivada (Fig.1).

- **Medida de la corriente derivada de acuerdo con VDE 0701.**
  Aplicar el medidor de corriente derivada (U_{prueba} = 220 V≈) simultáneamente a los dos polos de red y entre todas las partes del mueble o de funciones (antena, conectores, teclas, tornillos, etc.) de metal o aleaciones metálicas. El aparato estará libre de defectos con (Fig.2):
  $I_{deriv} \leq 1$ mA con U_{prueba} = 220 V≈.
  Tiempo de medida: ≥ 1 seg.

- Aconsejamos llevar a cabo las medidas con el **METRATESTER 3** (Instrumento de medida para la comprobación de aparatos eléctricos según VDE 0701).

  Metrawatt GmbH
  Geschäftsstelle Bayern
  Triebstr. 44
  D 8000 München 50
- Si no se cumple la seguridad del aparato, porque
  - la puesta en orden es imposible, o
  - existe el desco del usuario de no realizarla, se ha de comunicar a quien lo haga funcionar, por escrito, del peligro dimanante del aparato.

Recomendaciones para caso de servicio

- Emplear sólo componentes originales.
  Con componentes o grupos constructivos con el indicativo de seguridad ⚠ son de obligada necesidad piezas de repuesto originales.
- Las partes del aparato que contribuyan a la seguridad del mismo no deben estar deterioradas ni ser manifiestamente inadecuadas.
- Esto es especialmente válido para aislamientos o piezas aislantes.
- Los cables de red y de conexión se comprobarán, antes de conectarlos, en cuanto a defectos externos. Comprobar el aislamiento.
- Se ha de comprobar la función de seguridad de la compensación de tiro o de los manguitos de protección contra doblamientos.
- Repasar los puntos de soldadura sometidos a carga térmica.
- Mantener libres los canales aireación.

(USA) Safety Instructions

U.S. & Canada

⚡ The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage", within the product´s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

⚠ The exclamation point within an equilateral triangles is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

This product was designed and manufactured to meet strict quality and safety standards. There are, however, some installation and operation precautions which you should be particularly aware of.

- Read Instructions - All the safety and operating instructions should be read before the appliance is operated.
- Retain Instructions - The safety and operating instructions should be retained for future reference.
- Heed Warnings - All warnings on the appliance and in the operating instructions should be adhered to.
- Follow Instructions - All operating and use instructions should be followed.
- Water and Moisture - The appliance should not be used near water-for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, and the like.
- Wall or Ceiling Mounting - The appliance should be mounted to wall or ceiling only as recommended by the manufacturer.
- Ventilation - The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built - in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.
- Heat - The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.
- Power Sources - The appliance should be connected to a power supply only of the type given above or as marked on the appliance.
- Power-Cord Protection - Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.
- Cleaning - The appliance should be cleaned only as recommended by the manufacturer.

(x1) Power Lines - An outdoor antenna should be located away from power lines.

(x2) Outdoor Antenna Grounding - If an outside antenna is connected to the receiver, be sure the antenna system is grounded so as to provide some protection against voltage surges and built up static charges. Section 810 of the National Electrical Code, ANSI / NFPA No. 70-1984, provides information with respect to proper grounding of the mast and supporting structure, grounding of the lead-in wire to an antenna discharge unit, size of grounding conductors, location of antenna discharge unit, connection to grounding electrodes, and requirements for the grounding electrode.

- Nonuse Periods - The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.
- Object and Liquid Entry - Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.
- Damage Requiring Service - The appliance should be serviced by qualified service personnel when: The power-supply cord or the plug has been damaged; or objects have fallen,or liquid has been spilled into the appliance; or the appliance has been exposed to rain; or the appliance does not appear to operate normally or exhibits a marked change in performance; or the appliance has been dropped, or the enclosure damaged; or the batteries have been damaged.
- Servicing - the user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel .

Items (x1) and (x2) apply only to receivers or tuners.

Tools for error diagnosis

Service Test Programme

1. Introduction

In the software programme of the µC's, a service test programme has been recorded. The service test programme is divided into four modes of operation:

- Checking the tape deck functions
  deck µC mask number
- Checking the sensors in the tape deck
  deck status
  display µC mask number
- Operating-hours counter
- Continuous test

2. Calling up the Service Test Programme

The service test programme is called up by simultaneously pressing the 'STOP' button on the remote control and the 'PLAY' button on the video recorder for at least 5 secs.
On the display there then appears, in place of the tape counter reading, information about the first mode of operation of the service test programme. This can be changed to the next respective mode of service operation by pressing the 'TIMER' button on the remote control. The service test programme may be called up in any operational state of the video recorder, with the exception of station finding. During service mode the equipment remains fully operational in all tape deck functions. The test programme is switched off by pressing the 'STAND-BY' button or by disconnecting the VCR at the mains.

3. Forced RAM Clear

A forced RAM clear is possible by pressing STANDBY and EJECT on the set simultaneously when the set is being connected to the mains.

Attention:

The set loses all the information stored by the customer (presets, time, year etc.)

4. Checking the Tape Deck Functions

4.1. Time Required for Threading in and Threading out

For this check, the signal (FTA) from the light barrier, which controls the turning of the threading motor, is taken as the reference.

4.2. Failure of the Left or Right Winding Disk

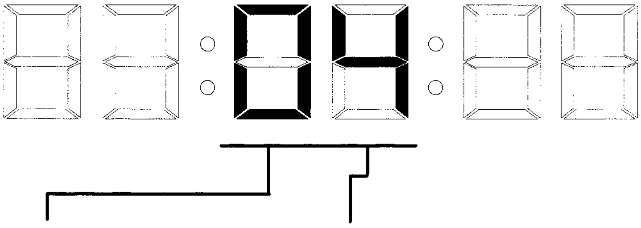
For checking this, the tacho signals from the left (WTAL) and right (WTAR) winding disks are taken as a a reference point. If one or both signals are absent, the video recorder attempts to bring the lift mechanism into the 'eject' position and switches to 'stand-by'.

4.3. Failure in the Head Wheel Motor

For checking this, the PG/FG signal is used. It is diverted from the EMK of that tape spool of the head wheel motor through which no current is flowing and indicates the position of the head wheel. If the PG/FG signal is not available, the VCR attempts to bring the lift mechanism into the 'eject' position and switches to 'stand-by'.

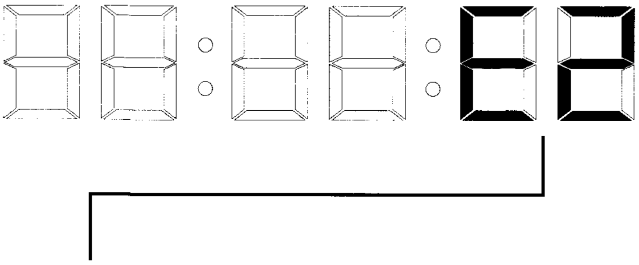
4.4. Explanation of the Error Code

After calling up the service test programme, the data for checking the tape deck appear in six figures (--:--:E-) in place of the tape counter reading. The first two figures indicate the mask-number of the deck µC. The figures in the middle indicate the status of the tape deck in which the error has occurred.



00	standby	21	pause dubbing
01	eject on	24	record insert
02	stop	28	play reverse x9
03	still	29	play reverse x7
04	play	30	play reverse x5
05	tuner	31	play reverse x3
06	record	32	play x5
07	play + tracking	33	play x7
08		34	play x9
09		35	
10	wind	36	record prepared
11	rewind	37	frame forward
12	pause	38	frame reverse
13	reverse	39	
14	play x2	40	
15	slow	41	slow 1/6
16	tuner eject	42	slow 1/2
17	stand by eject	43	
18	record simulcast	44	
19	record audio	45	slow reverse 1/6
20	record dubbing	46	slow reverse 1/2

The last two figures indicate the type of error.

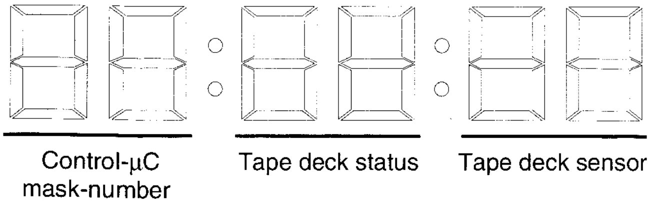


E0	no error
E1	threading error
E2	capstan error
E3	not used
E4	error of left tacho reel
E5	error of right tacho reel
E6	blocked headdrum

The last error code which occurred is stored in the TIMER BACKUP RAM and remains stored even if the VCR is disconnected from the mains. This error code can be erased by pressing the 'CLEAR' button in the service mode.

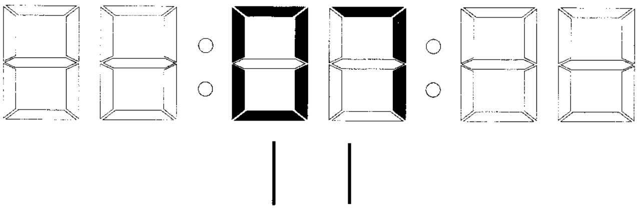
5. Checking the Sensors

By pressing the 'TIMER' button once, one proceeds from the tape deck check to the sensor check. The indicator is in this case 6-figured.



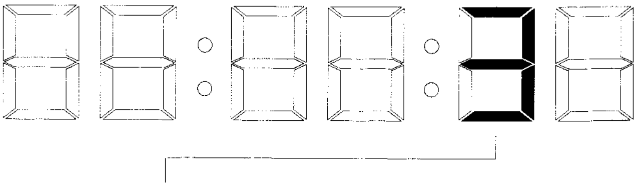
Tape deck status:

For this check, the signal (FTA) from the light barrier which controls the turning of the threading motor is taken.



			tolerance
Eject	0	5	+2
	0	6	+1
	0	7	0
	0	8	-1
	0	9	-2
Indexposition	6	4	0
	6	3	-1
	6	2	-2
	5		0
	5	E	-1
	5	-	-2
Play		8	+2
		7	+1
		6	0
		5	-1
		4	-2
Reverse	E		+1
	E	E	0
	E	-	-1

Tape deck sensors:

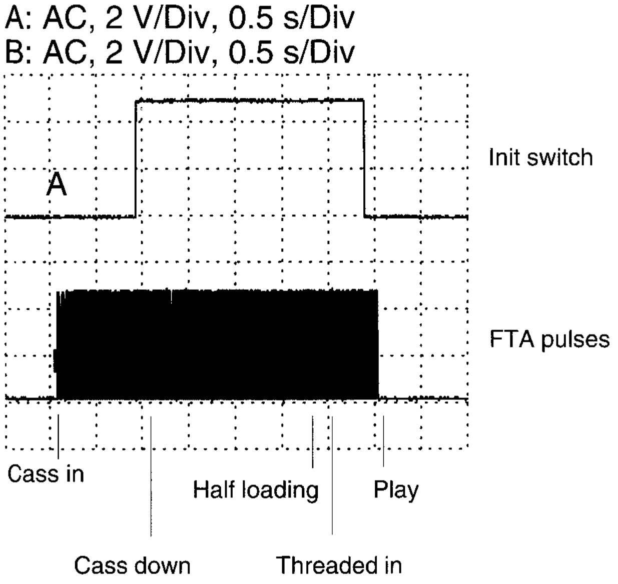


0	No pulse from winding tachometers
1	Pulse from right winding tachometer
2	Pulse from left winding tachometer
3	Pulse from both tachometers (1+2)
4	Init switch changes the display by ± 4

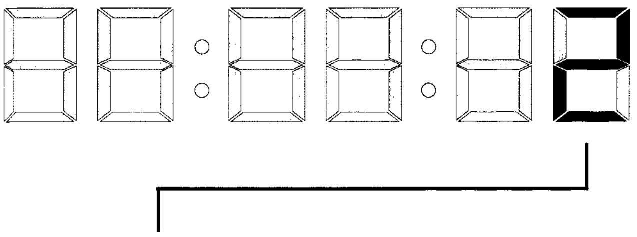
By turning the left winding tape reel the display will be changed by ± 1,by turning the right winding tape reel the display will be changed by ± 2.

Function of the Init switch:

The diagram shows the function of the init switch depending on the position of the tape deck.



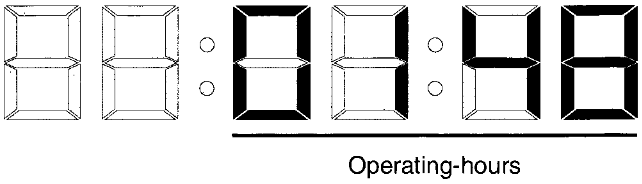
The amount of FTA pulses is significant for the position of the tape deck.



0 TAS + TAE is not acknowledged (no signal from LED)
1 TAS is acknowledged
2 TAE is acknowledged
3 TAS + TAE is acknowledged
4 RP check can only be made with the cassette

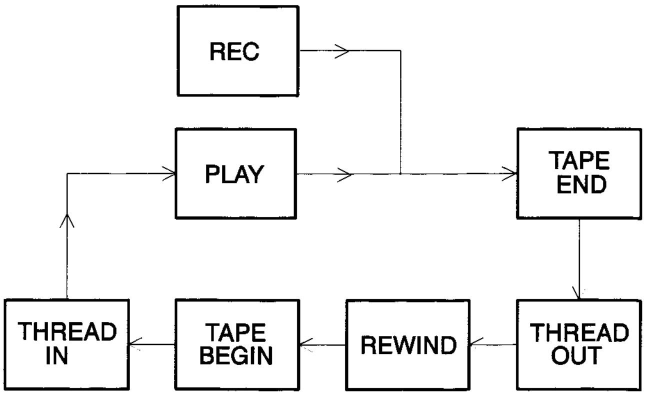
6. Operating-hours counter

After calling up the service test programme, the elapsed time indicator can be activated by pressing the 'TIMER' button twice. It indicates how many hours the head disk has been rotating. This indication is four-figured.



7. Continuous Test

The VCR can also be subjected to a continuous test in the service programme. For this, the set must be switched to one of the positions 'PLAY', 'REC' or 'REWIND'. The functions are then performed continuously. This check is designed to detect intermittent errors. The last error that occurred is stored in the TIMER BACKUP RAM (the error also remains stored after a mains failure). The continuous test is ended by exiting from the service test programme.



Servicing of SMDs (Surface Mounted Devices)

1. General cautions on handling and storage.

- Oxidation on the SMDs terminals results in poor soldering. Do not handle SMDs with bare hands.
- Avoid for storage places that are sensitive to oxidation such as places with sulfur or chlorine gas, direct sunlight, high temperatures or a high degree of humidity.As a result the capacitance or resistance value of the SMDs may be affected.
- Rough handling of circuit boards containing SMDs may cause damage to the components as well as the circuit boards. Circuit boards containing SMDs should never be bent or flexed. Different circuit board materials expand and contract at different rates when heated or cooled and the components and/or solder connections may be damaged due to the stress. Never rub or scrape chip components as this may cause the value of the component to change. Similarly, do not slide the circuit board across any surface.

2. Removal of SMDs

- Heat the solder (for 2-3 seconds) at each terminal of the chip. Small components can, by means of litz wire and a limited horizontal force, be removed with the soldering iron. They can also be removed with a solder sucker (see Fig. 1A) or
- While holding the SMD with a pair of tweezers take it off gently using the soldering iron's heat applied to each terminal (see Fig. 1B).
- Remove the excess solder on the solder lands by means of litz wire or a solder sucker (see Fig. 1C).

Caution on removal:

- When handling the soldering iron, use suitable pressure and be careful.
- When removing the chip, do not use undue force with the pair of tweezers.
- The soldering iron to be used (approx. 30 W), must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).
- The chip, once removed, must **never** be used again.

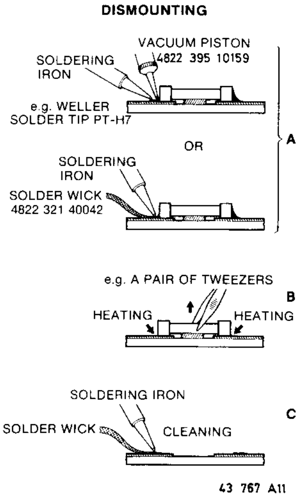

DISMOUNTING
VACUUM PISTON
SOLDERING IRON
4822 395 10159
e.g. WELLER SOLDER TIP PT-H7
OR
A
SOLDERING IRON
SOLDER WICK 4822 321 40042
e.g. A PAIR OF TWEEZERS
B
HEATING
HEATING
SOLDERING IRON
C
SOLDER WICK
CLEANING
43 767 A11

Fig. 1

3. Attachment of SMDs

- Locate the SMD on the solder lands by means of tweezers and solder the component at one side. Ensure that the component is positioned well on the solder lands (see Fig. 2A).
- Next complete the soldering of the terminals of the component (see Fig. 2B).

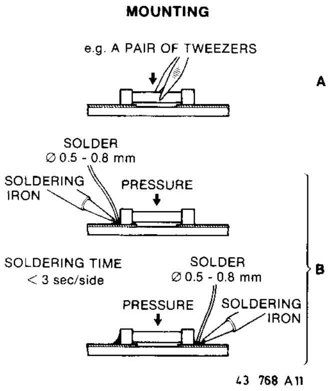

MOUNTING
e.g. A PAIR OF TWEEZERS
A
SOLDER
∅ 0.5 - 0.8 mm
SOLDERING IRON
PRESSURE
SOLDERING TIME
< 3 sec/side
SOLDER
∅ 0.5 - 0.8 mm
B
PRESSURE
SOLDERING IRON
43 768 A11

Fig. 2

Caution on attachment:

- When soldering the SMD terminals, do not touch them directly with the soldering iron. The soldering must be as quick as possible; care must be taken to avoid damage to the terminals and the body itself.
- Keep the SMD's body in contact with the printed board when soldering.
- The soldering iron to be used (approx. 30 W) must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).
- Soldering should not be done outside the solder land.
- Soldering flux (of rosin) may be used but should not be acidic.
- After soldering, let the SMD cool down gradually at room temperature.
- The quantity of solder must be proportional with the size of the solder land. If the quantity is too great, the SMD might crack or the solder lands might be torn loose from the printed board (see Fig. 3).

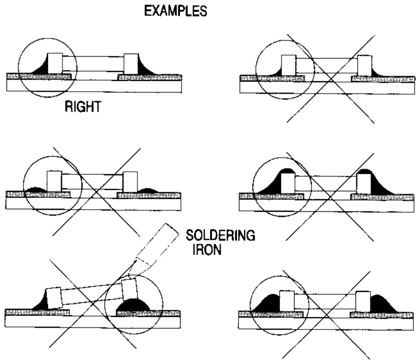
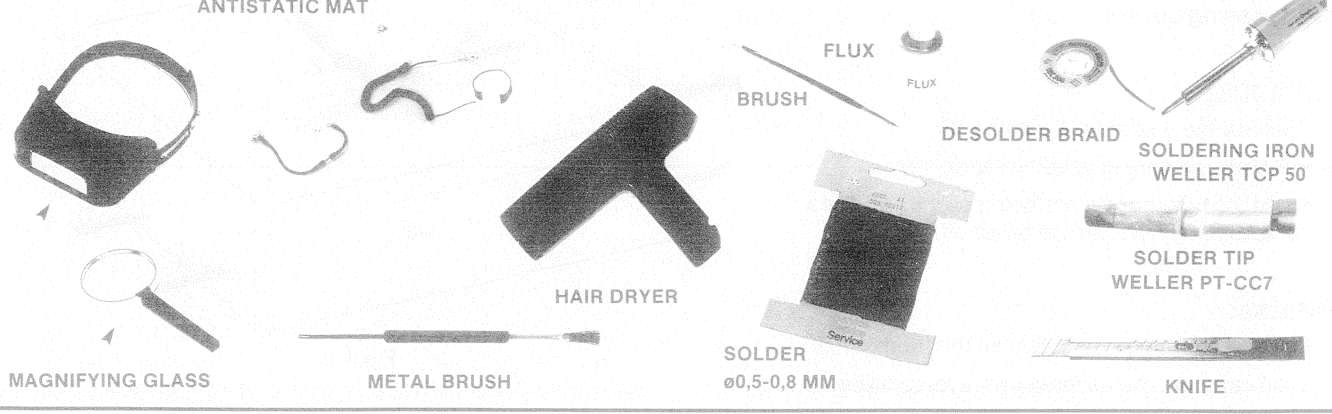

EXAMPLES
RIGHT
SOLDERING IRON

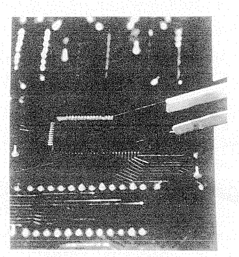
Fig. 3

FLATPACK REPLACEMENT

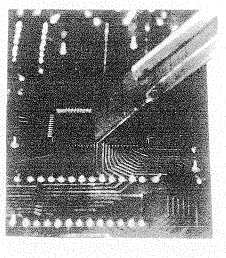
TOOLS TO BE USED


ANTISTATIC MAT
FLUX
BRUSH
FLUX
DESOLDER BRAID
SOLDERING IRON
WELLER TCP 50
SOLDER TIP
WELLER PT-CC7
HAIR DRYER
Service
SOLDER
ø0,5-0,8 MM
MAGNIFYING GLASS
METAL BRUSH
KNIFE

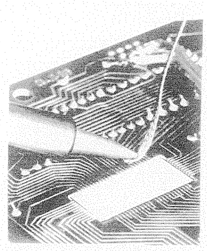
DISMOUNTING



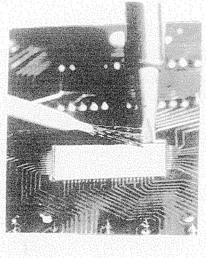
CUTTING
THE LEADS



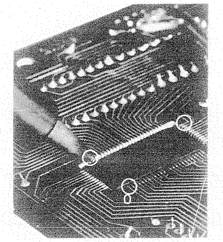
WRONG
TRACKS WILL
BE DAMAGED



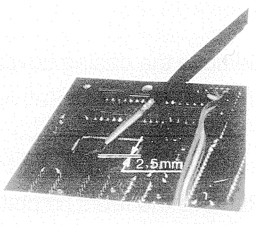
CLEANING
THE TRACKS



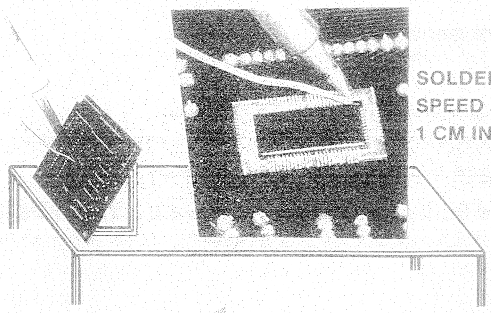
MOUNTING



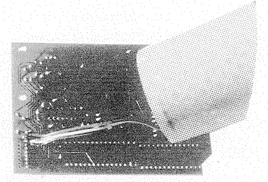
FIXING IC
AT THE CORNERS



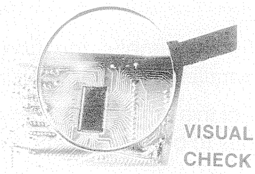
APPLYING FLUX



SOLDERING:
SPEED
1 CM IN 5 SEC.

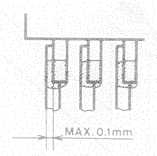


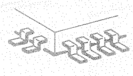
DRYING



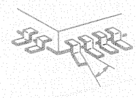
VISUAL
CHECK

ALIGNING THE LEADS

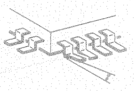




RIGHT

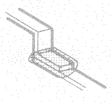


WRONG

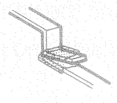


WRONG

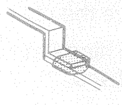
SOLDERING



RIGHT



WRONG



WRONG

Removal of case components and printed panels

1. The casing cover

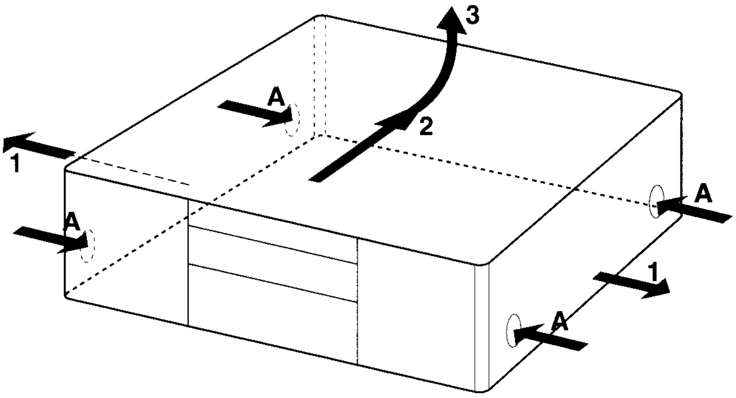


Fig.1

Dismantling:

- Unscrew the 4 screws A (see fig. 1).
- Pull back the casing cover for appr. 1 cm.
- When the side panels are being slightly pressed outward, the cover can be taken off.

Assembly:

- Place the front groove tightly on the front panel.
- Then carry out the assembly in reverse order.

2. The bottom plate

- Remove the casing cover.
- Unscrew the feet screws (option).
- Remove the rubber feet inserts by placing a screw driver in the round opening of the inserts and pull them down.
- Remove the feets by pulling carefully.
- Now the bottom can be lifted off by releasing the two snap hooks (see fig.2).

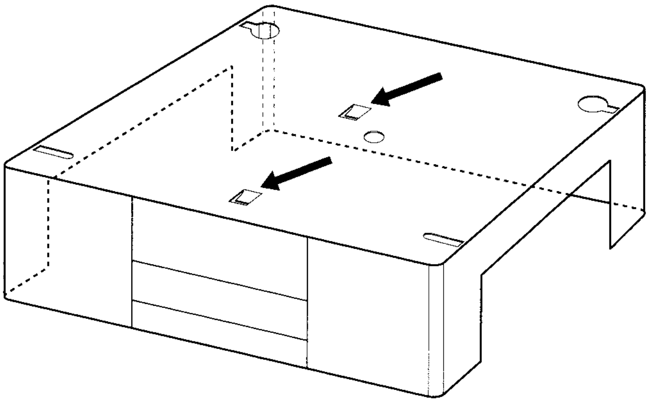


Fig.2

3. The front panel

- Remove the casing cover (see point 1).
- Unscrew the 4 screws at the upside of the control panel and release the four snap hooks (see fig.3).
- Press the front at the top slightly forward and remove it.

Note:

- For assembly, the front panel has to be slipped on in parallel to the control print.
- For this purpose, the lever which serves to open the lift flap has to be pushed into the flap guide.

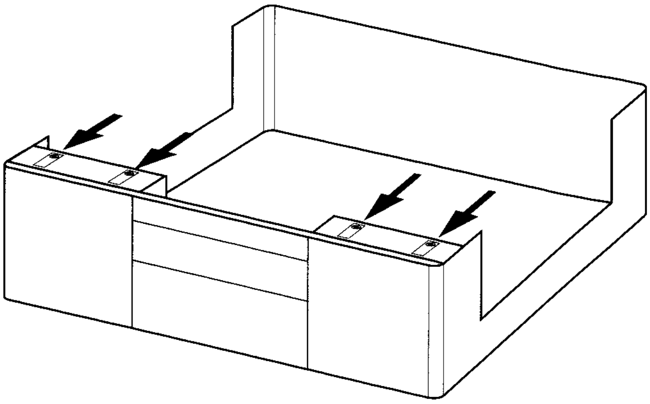


Fig.3

4. The front flaps

- Unscrew the fastening screw of the damper at the bottom side of the flaps.
- Remove the clamp and the damper.
- Lift the hinge at the inside and push it towards the middle of the flaps.

5. The supply unit

- Remove the supply unit by unscrewing the screw at the upside and by releasing the snap hooks (see fig.4).

6. The family board

- Release the family board by pushing down the two snap hooks and moving it to the right.
- Now lift the family board up (see fig. 5).

7. The control print

- Remove the control print by releasing the snap hooks at the upside.

8. The Tape deck

- Remove front panel and cover, see point 1 and 3.
- Unlock the 2 lift locks and manually move the lift 5 cm to the rear.
- Unscrew the 3 screws (see fig. 6).
- The whole tape deck can now be removed from the frame.

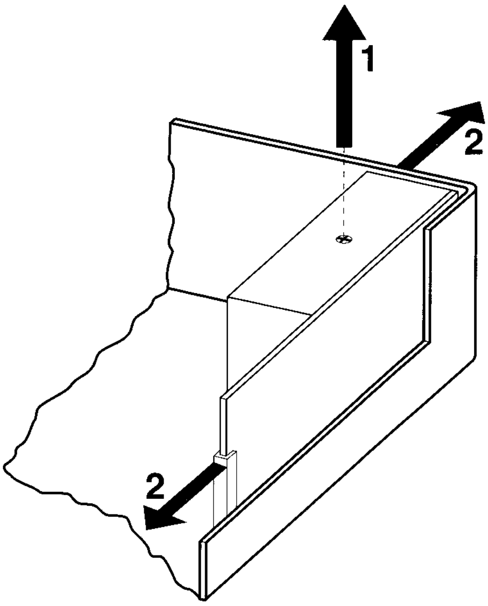


Fig.4

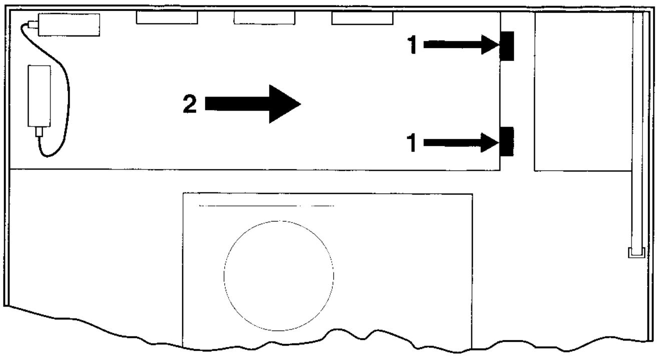


Fig.5

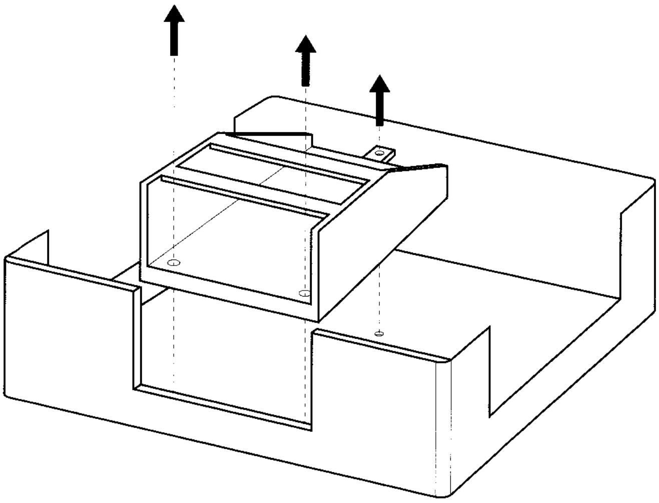


Fig.6

Descriptions

1. Power Supply (PS)

1.1 Primary Side

In this free-running blocking-oscillator type mains stage, the IC7005 carries out the drive and monitoring of the MOS power transistor CT7035 and also all necessary control and monitoring functions. The IC7005 receives on pin 1 information from the optocoupler OK7080 (mains isolation!) concerning the amplitude of the 12V supply on the secondary side. The current supply for the IC7005 takes place on pin 6 via the resistors R3052, R3053, R3055 and R3056 until the switch-on level is reached. After start up the supply voltage is obtained via the diode D6027 from the winding 11, 18 of the converter transformer.

The series circuit consisting of the power transistor CT7035 and the primary winding 12...17 of the blocking oscillator converter is connected to the rectified mains voltage (C2070). During the conducting phase of the transistor, energy is stored in the transformer which is fed to the secondary windings in the cut-off phase. The IC7005 controls the transferred energy by the switch-on period of CT7035 so that the secondary voltages are held constant irrespective of mains voltage and load changes. The required control information is produced via the optocoupler (see above). In addition, zero transition detection is carried out on IC7005-(8) by the information from winding 11, 18 via R3027.

Overvoltage and overload protection

If an overvoltage condition occurs, the supply voltage monitoring circuit responds via IC7005-(6) and interrupts the drive to the MOS transistor CT7035. If the overvoltage condition is still present after restart, the complete process is repeated ("sensing process").

With short circuit secondary voltages, the IC7005, in combination with the drain current simulation (pin 2), takes up a repeated scanning state and limits the power.

Mains undervoltage

In IC7005 a protection circuit for mains undervoltage conditions operates via pin 3. The threshold value is determined by R3007...R3009 and R3005.

1.2 Secondary Side

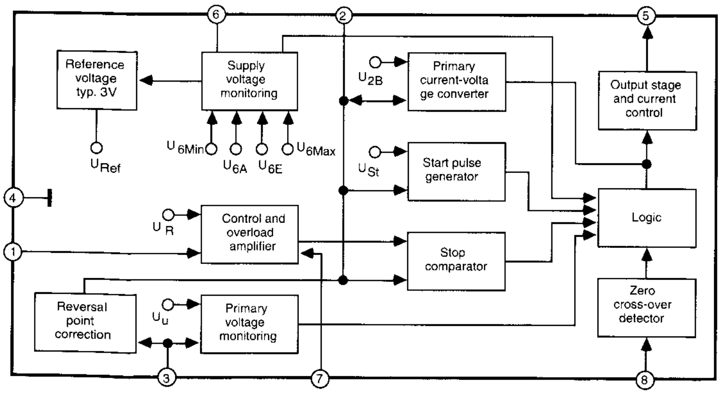
The voltages -F1 and +F2 are obtained from the windings 2, 3 and 4 via D6100/D6105. They are used for background illumination for recorders with LCD display (symmetrical to zero potential) and as the filament voltage for recorders with fluorescent display (VFD).

From contact 1 of the converter transformer the $+30V_D$ tuning voltage for the Tuner Module is supplied via D6120 / D6122. The $-30V_D$ voltage is obtained via D6115. This voltage is used by the keyboard computer of recorders with fluorescent display (VFD) to switch off the electrodes (grid, anode) of the display which are not required

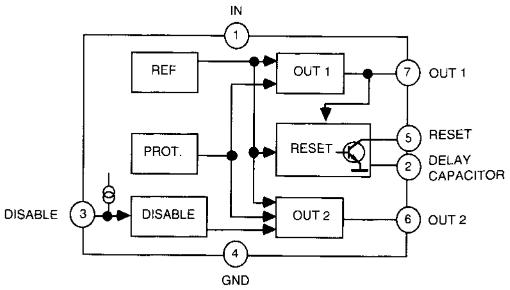
From contact 7 of the converter transformer an unswitched voltage is obtained and stabilised by IC7190. On pin 7 of this IC the $+5V_D$ voltage is present. When switching the recorder on, a $\overline{\text{RESET}}$ pulse (approx. 50ms) for the sequence control is fed out on pin 5. Additionally, the $+5V_F$ function voltage is present on pin 6 of IC7190 and switched by the $+12V_F$ voltage from IC7190-(3).

From contact 8 of the converter transformer the unswitched voltage $+14V_{DM}$ for the headwheel and threading motor is obtained via D6130. From contact 9 of the converter transformer the unswitched voltage $+12V_D$ is obtained via D6155 . From this voltage the $+8V_{DM}$ supply is derived via D6137...D6139. With the switching voltage present on connector contact 1509-9 either the $+8V_{DM}$ voltage or the $+14V_{DM}$ voltage is connected to the capstan motor via T7145 / CT7140.

TDA 4605:


6
2
5
Reference voltage typ. 3V
Supply voltage monitoring
U2B
Primary current-volta ge converter
Output stage and current control
URef
U6Min
U6A
U6E
U6Max
USt
Start pulse generator
4
UR
Control and overload amplifier
Logic
1
Stop comparator
Zero cross-over detector
Reversal point correction
Uu
Primary voltage monitoring
3
7
8

TDA 8137:


IN
1
REF
OUT 1
7
OUT 1
PROT.
RESET
5
RESET
2
DELAY CAPACITOR
DISABLE
3
DISABLE
OUT 2
6
OUT 2
4
GND

2. Family Board

2.1 Family Board – Sequence Control / Deck Electronic (DE)

Function Overview

The microcomputer µPD78134, IC7050, forms the heart of the sequence control. It has complete responsibility of the head and tape servo control, bus and tape deck drive. The multitude of tasks required of the microcomputer makes it necessary to use the external programme memories IC7060, IC7055 and IC7058.

The data traffic between the individual function groups and the sequence control is carried via three different data bus systems.

a) I^2C-bus

The I^2C-bus is a bi-directional two lead bus, consisting of the SDA (System Data) lead and the SCL (System Clock) lead. The data traffic is controlled from IC7050 which also generates the System Clock SCL. Use is made of a combination of 3 bus systems: I^2C-Bus-A (SDA-A/SCL-A), I^2C-Bus-B (SDA-B/SCL-B) and I^2C-Bus-C (SDA-C/SCL-A). Dependent on the version of the video recorder the I^2C-Bus-A and the I^2C-Bus-B can be identical.

The I^2C-Bus-A forms the connection between the sequence control computer and the following circuit sections:

NICAM Decoder (optional), IN/OUT, Tuner/Modulator Module, Frontend, FM-Sound, IC7060 (Clock-RAM) and IC7120 (VPS)

The I^2C-Bus-B controls the Teletext Function Group (DOS). The EEPROM (IC7058) is connected with the sequence control computer IC7050 via the I^2C Bus C.

b) Serial interface to the keyboard control unit

For the data communication with the keyboard control computer µPD75028 (M8) or µPD75236 (M6/M7) the following 4 leads are provided:

- B-DATA-A IC7050-(46)
- B-DATA-B IC7050-(3)
- B-$\overline{\text{CLOCK}}$ IC7050-(75)
- $\overline{\text{RESET}}$-B IC7050-(39)

c) Serial bus for port expansion

As there are insufficient output ports for the multitude of functions required of the sequence control computer, a port expansion circuit is necessary. For this, the sequence control computer IC7050 uses the following three serial bus systems:

- DATA - pin 70; CLOCK 390 - pin 35; STROBE 1 - pin 38 shift register - IC7095
- DATA - pin 70; CLOCK 1220 - pin 36; STROBE 1 - pin 49 shift register - IC7259 (Standard Sound)
- DATA - pin 70; CLOCK 205 - pin 73; STROBE - pin 69 shift register - IC7020
  - IC7607 / IC7705 / IC7710 (Video)
  - IC7850 (Frontend)

The data is loaded into shift registers with serial input and parallel output via the DATA and CLOCK leads and, with the STROBE lead carrying the transfer pulses, is switched to the outputs of the shift register.

Safety precautions for lithium batteries

Warning for lithium batteries:

Lithium batteries, if incorrectly used (excessive heat, wrong connection of terminals, short circuit) represent a danger of explosion!

Lithium batteries must be replaced **only** by **original spare parts** (see Spare Parts List).

Observe the appropriate disposal regulations for exhausted lithium batteries.

The sequence control consists of the following function groups:

- 2.1.1 Reset/power supply control
- 2.1.2 Threading motor control (lift/ threading mechanism)
- 2.1.3 Winding tachopulse processing
- 2.1.4 Beginning of tape / end of tape detection
- 2.1.5 Head servo control
- 2.1.6 Tape servo control
- 2.1.7 Tracking / autotracking
- 2.1.8 Clock RAM / EEPROM
- 2.1.9 VPS programme scanning

2.1.1 Reset / Power Supply Control

After plugging the recorder into the mains, the sequence control computer receives on IC7050-(29) the reset pulse $\overline{\text{RESET}}$ generated by the power supply. When the sequence control computer is initialised it releases the function voltages $+12V_F$ and $+5V_F$ from the shift register IC7020-(4) via the serial bus for port expansion in order to set the tape deck into the "Stop" or "Cassette Eject" position.

Additionally, the B-$\overline{\text{RESET}}$ pulse is fed out on IC7050-(14); this pulse is passed on through plug contact 1510-4 to the keyboard control unit.

2.1.2 Threading Motor Control (lift / threading mechanism)

The lift and threading mechanism is driven by the threading motor. For driving the threading motor, the resistor network R3133...R3147 is used to convert the digital signal which is taken from the sequence control computer IC7050 via a serial data bus to the shift register IC7095 to an analog control signal. This signal drives the threading motor via the threading motor driver IC7100-(6), -(7) / -(1), -(3) and plug contact 1506-1, -3.

The µC detects the position of the tape deck by counting the threading tachopulses (FTA) in connection with the INIT switch and the identification "TAS" for the beginning of the tape, and "TAE" for the end of the tape. The threading tachopulses (FTA) are supplied to the µC via plug contact 1502-6 and IC7040-(8), -(14). The tape deck is fitted with a switch for initialisation of the threading tacho (INIT) and another for erase protection ($\overline{\text{REC}}$). The voltages resulting from the switch settings are coupled via the plug contacts 1502-3, -7, R3165 (INIT) and R3164 and fed to the IC7050-(25).

The lift is mechanically connected with the threading tacho generator (vane wheel). When loading a cassette into the cassette compartment the cassette must be inserted as far as is necessary to generate three threading tachopulses. Afterwards, the sequence control computer activates the threading motor which then takes over the loading of the cassette.

When ejecting the cassette, the phototransistors detecting the beginning and the end of the tape are enabled simultaneously a short time before the lift reaches the end position. A short time later, the threading motor is automatically switched off by the sequence control computer.

2.1.3 Winding Tachopulse Processing

The optocouplers on the left (WT1) and right (WT2) winding carriers produce 8 pulses per revolution. These pulses are formed into rectangular signals by IC7040 (pins 6/9 –> pins 17/12) and applied to pins 7 and 8 of IC7050. This IC calculates the instantaneous tape position and the total length of the cassette from the ratio of these two frequencies.

2.1.4 Beginning of Tape / End of Tape Detection

To identify the beginning of tape and end of tape, the VHS cassette has a clear foil, 13-19cm long, on each end of the tape. The beginning and end of tape is identified by two optocouplers. For this purpose, the transmitting diode which is triggered by CT7110 is inserted into a hole in the middle of the cassette. The phototransistors are located at the outside, left and right, of the cassette.

The phototransistors "TAS" (beginning of tape) or "TAE" (end of tape) supply pulses as soon as they detect the beginning or end of tape. The output voltages of the phototransistors are directly taken to the analog inputs of the µC IC7050-(26), -(28).

2.1.5 Head Servo Control

The head servo control ensures that the rotational speed and the phase of the headwheel drive are correct. The complete control is carried out in the µC (IC7050). The actual values are derived in the headwheel motor driver (IC7301) in the head amplifier from the information given by the Hall generator or the position coil located in the headwheel motor (threephase motor) in connection with the phase voltages. At the output IC7301-(15) there are the PG (phase generator) pulses of 25Hz for the phase control and also the FG (frequency generator) pulses of 450Hz for the speed control. From the connector 1501-1 the FG/PG pulses are fed to the sequence control. The FG pulses are decoupled by the monoflop (CT7067 / CT7070) and fed to pin 10 of the µC. The PG pulses are decoupled by CT7065 and supplied to IC7050-(1).

On IC7050-(17) the µC feeds out a pulse-width-modulated square-wave signal (REEL) containing information on the speed and the phase. This signal is fed through the bridge resistors (R3113 / R3115 / R3120 / R3121 / R3123) and plug contact 1501-6 to the headwheel motor driver IC7301 located in the head amplifier and is used as a control voltage.

2.1.6 Tape Servo Control

The capstan motor is a threephase motor which is fitted with Hall generators. These generate signals which are fed to the capstan motor driver IC (CXA-8005AS) on the capstan motor assembly via the pins 1...6. Depending upon the signals this IC is responsible for the commutation of the individual phases of the capstan motor.

Switching over of the sense of rotation (CREV) is carried out via pin 15 of the CXA-8005AS. For this the µC (IC7050) feeds out from pin 39 a LOW level for the forward sense of rotation or a HIGH level for the reverse direction. This control signal is passed through D6095 and plug contact 1502-13 to the capstan motor driver. For speed control, the FG Hall element (Magneto Recitive Element) in the capstan motor generates pulses at a frequency of 1514Hz at the rated speed. The pulses are amplified in the capstan motor driver and fed to the internal comparator via plug contact 1502-15 and pin 7 of the IC7040. The tachopulses (actual value) are compared in the IC7050 with an internally generated reference value. From IC7050-(18) the µC feeds out a pulse-width-modulated square wave voltage. This is integrated by R3110 / C2082 and fed via plug contact 1502-14 as a control voltage to the capstan motor driver IC (CXA-8005AS).

For the functions "Wind/Rewind" and "Picture Search Forward/Backward" (≥3) the supply for the capstan motor driver is switched over from $+8V_{DM}$ to $+14V_{DM}$. This is done by the sequence control computer via the shift register IC7095-(11) and the plug contact 1509-10 on the power supply.

2.1.7 Tracking / Autotracking

During recording, encoded 25Hz-CTL-pulses are recorded onto the tape via the sync head. These pulses are required on playback for tracking control, for identification of the 16:9 picture format and for index search.

On recording, the 25Hz pulses are taken from IC7050-(16), -(11) to IC7040-(18) and are then passed through IC7040-(2) and the connector 1503-6 / 1503-7 to the sync head.

On playback, the recorded CTL pulses are scanned by the sync head to be subsequently converted to square wave pulses in IC7040 and passed on via IC7040-(18) to IC7050-(16), -(11).

When a cassette is loaded, the Autotracking function determines the optimum track position on playing back. For this, a voltage $\underline{U}/\overline{FMEP}$ is derived from the envelope of the FM packages and fed in to the main computer IC7050 on the analog input AN3 (pin 24). This voltage is generated in the head amplifier and integrated by R3647 / C2495 (Video/ Chroma circuit stage).

On the basis of the tracking centre position, the set tracking value is increased or reduced. For each of the two directions, an appropriate nominal value is determined at which the voltage derived from the FM envelope $\underline{U}/\overline{FMEP}$ starts to decrease as against the maximum determined voltage level. The mid-value from the two limit values is then used as the optimum tracking value. On completion of this measurement, the autotracking function is switched off and the determined phase is controlled by the CTL pulses.

If more than two successive CTL pulses are missing, the autotracking function is reactivated assuming, in this case, that a new recording with a different tracking position is played back.

When stopping the autotracking function with the " ▶ " button the nominal tracking value is fixed by the µC. The phase control has the task of maintaining the nominal tracking position once it has been set.

2.1.8 Clock RAM / EEPROM

The clock pulse is generated in IC7060 with the 32.768kHz crystal oscillator. From this pulse, the IC7060 generates the time and date which are then supplied on the I²C-bus to the sequence control computer IC7050. The 2kBit RAM in IC7060 is used for storing the subtitles, station fine tuning, television standards, display dimmer value, timer data and child lock code. The RAM serves also to enter and to read out the specific data of the machine (e.g. the specified value of the head position pulse). A lithium battery ensures that the data is held in the case of an interruption of the power supply (mains failure, disconnected mains plug).

The 8kBit-EEPROM (IC7058) holds the data for titles, channels, abbreviated station names and videotext pages (DOS). The data is transferred via the I²C-Bus-C (SDA-C / SCL-A)

2.1.9 VPS Programme Scanning

The sequence control computer takes up a scanning mode if two and more VPS transmissions have been preprogrammed. For this, the computer tunes the tuner at certain intervals and for a short time to the respective TV stations. The IC7120 reads out the current VPS data and transfers it on the I²C-Bus-A to the sequence control computer, IC7050-(75), -(76). It is therefore ensured that the sequence control computer detects also transmissions for which the TV stations have fixed an earlier broadcasting time than originally planned, and that the video recorder is controlled accordingly.

2.2 Family Board – Teletext "DOS" (OS)

Function Overview

The DOS unit contains a Test Pattern / Data Generator and the Teletext processing stage. For this the following function groups (ICs) are required:

- IC7150, IVT (Integrated Video-Input-Processor and Teletext)
  slicing and processing the Teletext signals offered by the TV station,
  timing of all functions including line linterlace suppression, character generator with appropriate R, G, B, sync, switching signals and memory control.
- IC7160, page memory - for storing the data obtained from IC620.
- IC7190, RGB Encoder - for generating the DOS-CCVS-signal.
- For voltage supply the +5V$_F$ operating voltage is used.

2.2.1 IVT and Page Memory (IC7150, IC7160)

The IVT consists of the following function groups:
Data slicer, data acquisition, page memory interface, character generator, clock-PLL, control logic and the I²C-bus interface.

- **Data slicer**

  The adaptive data slicer extracts the Teletext data from the CCVS signal fed in via IC7150-(36). For this, the video signal is taken to an A/D converter with a scanning frequency of 13.5MHz. The text data is then separated and the appropriate 6.9375MHz clock is generated from the digitised video signal.

- **Clock-PLL**

  The 27MHz oscillator frequency is first of all divided to 13.5MHz for the A/D converter. A digital PLL generates the basic frequencies 6MHz, 1MHz, and 15,625kHz. The generated line frequency is then fed to a phase comparator along with the line sync signals separated from the CCVS signal. The characteristic of the digital loop filter which follows is influenced by the $\overline{\text{VCR}}$ input on the IC7150-(42) and the 6MHz oscillator is controlled accordingly. By this method, all frequencies generated in the IVT are synchronized to the line frequency of the incoming CCVS signal. In unsynchronized condition (eg. CTI test pattern) no phase comparison takes place.

- **I²C-bus interface**

  This interface permits control of all operations from the main computer (IC7050) and also to read data into each storage location of the page memory and to read it out. The interface carries out the serial-parallel conversion. The data, parameters and menu tables for Text Programming are stored in the EEPROM (IC7058).

- **Control logic**

  The control logic consists of several counters, gate circuits and control registers which can be controlled via the I²C-bus-B. The control logic is supplied with the internally generated 6MHz, 1MHz, H and V-frequency pulses. In this way, the sync signal, the pixel clock for the character generator, and the control signals for the page memory interface are produced among others.

- **Data acquisition**

  During the lines 2...22 and 315...335 the control logic provides a so-called data input window. The acquisition circuit identifies by a determined frame code the presence of text data. Subsequently, the text data is subjected to a serial/parallel conversion and an error detection and correction. When the user calls up a text page a register with the page number is loaded via the I²C-bus-B. The acquisition circuit then compares all incoming page numbers with the requested page and initializes the storage of the page in the page memory IC7160.

- **Page memory interface**

  The data is transferred to the page memory (IC7160) on the 8 data lines IC7150-(3)...-(5), -(60)...-(64) and the 11 or 13 address lines IC7150-(6)...-(22). The writing and reading processes are controlled via IC7150-(23), -(24). For displaying the data without line interlace, the interface permits to read in and to read out the data simultaneously during one line period.

- **Character generator**

  There are 256 different characters. Each of these characters is allocated a 8bit data word. Apart from 32 control characters, the set consists of graphic or alphanumeric characters composed in the form of a raster point matrix of 12 horizontal and 10 vertical points. The characters are stored in the Character ROM in the IVT. The line-coupled 1MHz clock is used to switch the addresses fed in to the page memory. The 8bit code representing one character in turn forms one part of the address fed in to the character ROM. The other part is produced by a H-frequency line counter. The result is a 12bit data word present at the output of the ROM after 1µs. This data word is entered into a shift register and is read out at a 12MHz clock derived from the 6MHz clock. The corresponding R/G/B signals are available from the push-pull outputs IC7150-(44), -(45), -(47). The maximum output level of the R/G/B signals is determined by the voltage present on IC7150-(48). The blank signal from IC7150-(52) is used to control the switch IC7420 in the IN/OUT stage.

2.2.2 RGB Encoder (IC7190)

The R/G/B signals from IC7150 are present on IC7190-(2), -(3), -(4). On pin 10, the IC7190 receives the sync signal from IC7150, and on pin 6 the colour subcarrier (4.43MHz). In IC7190 the incoming signals are processed to the CCVS signal which is then fed from IC7190-(20) to the pins 1 and 10 of the switch IC7420 in the IN/OUT circuit stage.

2.2.3 Recording of Subtitles

For recording subtitles without colour errors the colour carrier phase for the R/G/B Encoder IC7190 must be switched at half the line frequency. For this, the frequency $F_{H/2}$ (burst phase) is supplied to the transistor T7167, is amplified, converted by T7164 / T7165 to a square wave signal and fed into IC7190 on pin 7.

When generating complete pictures instead of subtitles, the "Blank" signal $\underline{\mathrm{U}}{\downarrow}\overline{\mathrm{DOS}}$ from IC7150-(52) and the transistor T7170 are used to switch off the signal $F_{H/2}$ for IC7190.

In the IN/OUT circuit stage, the "Blank" signal $\underline{\mathrm{U}}{\downarrow}\overline{\mathrm{DOS}}$ is taken directly to the control input IC7420-(4), meaning that the subtitles and text tables are fed in immediately before the AV socket or the modulator. In another path, the DOS-CCVS signal is fed into the recording path on precondition that the $\underline{\mathrm{U}}{\downarrow}\overline{\mathrm{DOS}}$ signal is switched to IC7420-(7) via T7426 by enabling IC7410-(17) "Open Collector".

2.3 Family Board – Frontend (FE)

The frontend has the task of amplifying and demodulating the signal coming in from the Tuner Module. It produces the CCVS signals and the following AF signals:

- Mono sound: IC7790-(10)
- Stereo sound: Right: IC7780-(11); Left: IC7780-(12)
- Two channel sound: Sound 1: IC7780-(11);
  Sound 2: IC7780-(12)

The IF signal from the tuner contact 17 is fed to the surface wave filter (F1170) in which the video signal is separated. The IF signal for sound signal separation is passed through T7735 to the surface wave filter F1140.

Video processing

The video IF is fed in on IC7910-(1), -(20). The signal passes through a gain controlled wideband amplifier with synchronous demodulator, a video amplifier and also a gain control voltage generation stage for the tuner. From IC7910-(14) the CCVS signal is fed through the sound trap F1185 to IC7910-(13). Via a buffer stage, IC7910-(12) and a stage for lifting the chroma signal (CT7915 / CT7917) the CCVS signal is taken to the IN/OUT-circuit stage.

Sound processing

The IF signal for sound signal separation is passed through the emitter follower T7735 to the surface wave filter F1140 (B/G-Standard, FM-sound, vision-sound separation 5.5MHz / 5.742MHz). Subsequently, it is taken via IC7790-(27), -(28), an input selection switch and an amplifier to the converter in which the signal is converted to 5.5MHz / 5,742MHz. The 5.5MHz signal is taken from the IC7790-(20) via the filter F1147 to IC7790-(18). The 5.742MHz signal from IC7790-(20) passes the filter F1152 and is applied to IC7790-(22). Each of the two signals then passes through an amplifier followed by a synchronous demodulator and, via IC7790-(10), -(9), are carried to the stereo decoder IC7780-(7), -(8).

Mono sound

On Mono transmissions only one signal is present on IC7790-(10). The evaluation circuit in the decoder IC7780 identifies the MONO status and advises the sequence control computer IC7050 via the I^2C bus (pins 1 / 20). From the sequence control computer, via the I^2C bus, the output selection switches in IC7780 are set to MONO and the sound signal is connected to the output pins 12 / 11. From there, the signal is taken to the IN/OUT circuit stage for FM recording. For linear track recording, the sound signal is fed from IC7790-(10) to the Standard Sound circuit stage.

Stereo sound

On a Stereo transmission the sum signal $\frac{L+R}{2}$ is present on IC7790-(10) and the R signal with pilot tone (117Hz amplitude modulated) is present on pin 9. Via the pilot circuit (C2807 / L5807) and pin 5 of IC7780 the pilot signal is fed to the evaluation circuit. In this circuit the decoder identifies the stereo status from the presence of the 117Hz signal and the sequence control computer is advised via the I^2C bus. The sequence computer controls the matrix in IC7790 via the I^2C bus so that from the signals $\frac{L+R}{2}$ and R, the Stereo signals L and R are obtained and it also sets the output selection switch to the "Stereo" setting. On pins 12 (L) and 11 (R) the signals are fed out and applied to the IN/OUT circuit stage.

Two-channel sound

On a Two-Channel Sound transmission, the sound channel 1 is present on IC7790-(10) and the sound channel 2 with pilot tone (274Hz amplitude modulated) is present on IC7790-(9). By means of the evaluation circuit the decoder identifies the two-channel status from the 274Hz present and advises the sequence computer via the I^2C bus. The sequence computer controls the output selection switch via the I^2C-bus so that sound channel 1 (pin 11) and sound channel 2 (pin 12) are provided and connected to the IN/OUT circuit stage.

2.4 Family Board – Video/Chroma (VS)

Loop-through signal path (EE)

The CCVS signal selected in the IN/OUT circuit section is fed to pin 33 of IC7510. In this circuit, the signal passes through the VIDEO-AGC-stage, an A/W-switch and, after the video amplifier (VIDEO AMP), is fed out from IC7510 on Pin 30. Subsequently, the CCVS signal is taken to the IN/OUT circuit section from which the signal is supplied to the Modulator and, on another path, to the EURO-AV sockets.

The EE-level is adjusted with the control R3635 (EE).

2.4.1 Family Board – Video

Function overview

On record, the CCVS signal is processed and the luminance signal is converted to a frequency-modulated signal in the video circuit stage.

On playback, the frequency-modulated signal obtained from the tape passes through a demodulator, a dropout compensator, an equalizer stage and the crispening stage. Thereafter, the CVS signal is added to the chroma signal and fed to the IN/OUT circuit stage.

Record signal path

The CCVS signal selected in the IN/OUT circuit stage is fed from pin 33 to the Video-AGC-stage, then passes through an A/W-switch, a 3.5MHz lowpass filter, a clamping stage (CLAMP), and a few stages which are not active on record mode. After the A/W-switch the signal is fed out from the IC7510 on Pin 41. Via a phase compensation stage - all-pass (T7590 / R3787 / C2590 / L5590) the signal is routed to the amplifier stage T7591. This stage contains a rejection filter (F1110 / C2593) which suppresses the chroma component of the CCVS signal. The generated CVS signal is fed via an

emitter follower (T7597), R3808 and C2605 to IC7510-(42). In this IC, the signal is subjected to a clamping stage, a DETAIL ENHANCER and the NLE-stage (non-linear emphasis).
On SP mode the DETAIL ENHANCER and on LP mode also the NLE-stage is active. The NLE-stage is activated (at LOW level) via the shift register IC7607-(7) und T7612. The linear pre-emphasis (MAIN EMPH) which follows increases the high-frequency components of the CVS signal linearly. This preemphasis is reversed on playback mode. As a result, the signal-to-noise ratio is improved. The peripheral circuit for the Detail Enhancer consists of the C2615, for the non-linear network it consists of C2612 and R3825, and for the linear network it is made up of C2610, R3820, C2617 and R3827. Between IC7510-(43) and IC7510-(38) the black level (R3752) and the white level (R3755) of the luminance signal are adjusted which is then fed to the FM Modulator in the IC7510. The frequency-modulated signal is fed out from pin 36 of IC7510 and is taken through the FM-filter (L5550 / C2550 / L5545 / C2543 / R3715 / C2542 / C2548 / L5549 / R3714) to the junction R3713 / R3700 or R3702 where it is added to the chroma signal. The sum signal is passed through the amplifier stage T7541 / T7540, the control R3707 (YWC) and plug contact 1506-2 to the head amplifier.

Playback

On playback, the gain controlled FM signal from the tape passes through plug contact 1506-9 to the amplifier stage T7433.The following signal path divides for S-VHS and VHS playback.
On **S-VHS** playback mode, the FM signal is fed to a bandpass (C2435 / F1093), a transistor stage with a 12.5MHz rejection filter (L5440 / C2440), a 627kHz rejection filter (L5437 / C2437) and a frequency response correction circuit (L5438 / C2438 / R3578). Having passed a delay correction - all-pass filters (F1095 / L5445 / C2442 / C2445 / C2448 / C2443 / C2446 / L5443 / L5446) the signal is taken via the emitter follower T7450 to pin 35 of IC7510.
On **VHS** playback mode, the FM signal is fed to a bandpass (C2453 / F1098 / C2452 / R3592) and the transistor stage T7457 with a 9MHz rejection filter (C2501 / L5501) and a 627kHz rejection filter (C2503 / L5503). Having passed the delay correction circuit which follows (F1100 / F1101 / C2457 / C2460 / C2458 / C2461 / L5458 / L5461) the FM signal is taken via the emitter follower T7465 to pin 35 of IC7510.
The signal paths are activated (active at HIGH level) via the shift register IC7607-(4) on S-VHS playback and via pin 7 of IC7710 on VHS playback.
In IC7510, the signal path divides. In one path, for dropout detection, the "FM from the tape" is fed to the dropout detector (DOC DET) which produces a defined period pulse, corresponding to the loss of level, to the dropout compensation switches (DOC). In another path, the signal is taken via a limiting circuit (DOUBLE LIMIT), an FM demodulator, a lowpass filter (SUB LPF), a deemphasis stage (MAIN DEEMPH) with playback amplitude control and an A/W-switch to pin 41 of the IC7510. The externally connected components of the deemphasis stage are the R3780, R3778 und C2583. Adjustment of the playback amplitude is possible with the control R3768 (PBA) via IC7510-(40). Afterwards, the CVS signal is passed on via a phase compensation stage (T7590 / R3787 / C2590 / L5590), an amplifier stage (T7591 / T7597), R3808 and C3605 to IC7510-(42). In IC7510, the signal is clamped (CLAMP) before the A/W-switch and after the 3.5MHz-lowpass filter which follows.
Afterwards, the signal path divides. In one path, the luminance signal is fed through a dropout switch, an A/W-switch and, after the output stage (ATT), leaves the IC7510 on Pin 7. In the following delay circuit (IC7625 / T7633 / F1120 / T7623) the signal is delayed by one line and is then taken via IC7510-(4), the amplifier stage (VCA) and the clamping stage (CLAMP) to the dropout switch. If there are dropouts in the signal, the dropout switch changes over to the faultless delayed signal. In the other path, the non-delayed and delayed CVS signals are subtracted in a difference amplifier. The resulting low-frequency noise voltage is added at opposite phase to the non-delayed Y-signal via a weighting network. The noise-reduced Y-signal passes through the non-linear deemphasis (NL DE EMPHASIS), the noise reduction stage (WHP NOI CAN) for high-frequency noise voltages and a high-frequency preemphasis (PICTURE CONTROL). This preemphasis is operated from the shift register, IC7705, R3934, R3935, R3937 and IC7510-(8). In the following "Y-C-MIX" stage the Y-signal is added to the internally fed in chroma signal. The regenerated CCVS signal is passed through an A/W-switch, the V-pulse sampling stage (QV / QH), a video amplifier (VIDEO AMP) and is fed out from pin 30 of the IC7510. Subsequently, the CCVS signal is taken via the IN/OUT circuit stage to the Modulutor and the EURO-AV sockets.

2.4.2 Family Board – Chroma

Function overview

On record the 4.43MHz chroma signal is converted to 627kHz with the aid of a mixing frequency of 5.06MHz.
On playback the 627kHz chroma signal is reconverted into the original 4.43MHz chroma signal with the aid of the mixing frequency (5.06MHz). The signal is amplified, added to the luminance signal and passed on to the IN/OUT circuit stage.

Record

On record the signal path is the same for PAL and MESECAM (Secam East).The CCVS signal is supplied from the IN/OUT circuit stage via pin 33 to the IC7510. In this IC, the signal passes through the Video-AGC-circuit, an A/W-switch and an integrated bandpass (4.43MHz). Here, the chroma signal is separated from the CCVS signal. The chroma signal is then taken via an A/W-switch, a gain controlled amplifier (ACC. D. AMP) and a burst emphasis stage (not active) to the main converter (MAIN CONV). In the main converter, the chroma signal (4.43MHz) is mixed with the subcarrier frequency (5.06MHz). In an internal lowpass filter unwanted mixing products are eliminated from the converted chroma signal (627kHz). Having passed the colour killer which follows and the A/W-switch the signal arrives at pin 10 of IC7510. It is then fed through an additional trap L5530 / C2530, the control (CWV) to the emitter follower T7532 or R3699. Afterwards, at the junction R3700 or R3702 and R3713, the signal is added to the FM-video signal. The sum signal is taken via the amplifier stage T7541 / T7540 to the control R3707 (YWC) and via plug contact 1506-2 to the head amplifier.

Playback

Via plug contact 1506-11 the uncontrolled FM signal from the tape arrives at the chroma circuit stage. In the bandpass (R3930...R3927), the 627kHz chroma signal is filtered out to be amplified in the following transistor stage T7700 / T7698. Subsequently, the signal path divides into the direct (R3918) and a delaying signal path (C2691). The latter consists of a CCD delay lead (IC7690), the amplifier (T7687), the lowpass filter (L5685 / C2685), the phase shifter (all-pass), the emitter stage T7683 and the switching stage (T7680 / T7681). These two paths form the so-called "comb filter" for cross-talk compensation.

The function of a comb filter is to delay the signal in one circuit path by two lines periods for the **PAL** system and by one line for the **NTSC** system and to add it to the signal from the undelayed path. In this case, the delay of the playback signal takes place between IC7690-(1) and IC7690-(3). Afterwards, the signal is routed to the amplifier T7687, the lowpass filter L5685 / C2685 and a phase shifter (all-pass), in which the amplitude of the delayed signal is adjusted in phase by R3900 and C2683 to drive the emitter stage T7683. This stage provides on the collector a 180°-phase-shifted signal so that during one half field an addition with the direct signal (from the phase shifter) and during the other half field a subtraction can be carried out. The signal passes the switching transistors T7680 / T7681 and is then controlled by the HI chroma pulse so that it is supplied to the control (CF) R3618 at a phase of 0°, and after switching over, at a phase of 180°.

In this stage the delayed signal is added to the direct signal. With the PAL standard, the CCD lead IC7690 is clock-actuated at a frequency of $1f_{sc,}$ that is it is delayed by two lines. With the NTSC standard, the CCD lead is clock-actuated at $2f_{sc}$ resulting in a one-line delay.

In **SECAM** mode the delayed signal path is not used. The 627kHz chroma signal is fed through T7708 to the control (CF) where the two direct signals are added. The T7708 is operated by the voltage U↓SEC-E from the shift register IC7710-(12).

From the control (CF) the 627kHz chroma signal is taken via the emitter follower T7695 to IC7510-(10). The signal then passes two A/W switches, a gain controlled amplifier (ACC. D. AMP), a burst emphasis stage (not active) and arrives at the main converter (MAIN CONV) where it is mixed with the subcarrier frequency (5.06MHz). The reconverted chroma signal (4.43MHz) is fed through an A/W-switch to the integrated 4.43MHz bandpass. Having passed another A/W-switch, the signal is applied directly to the PAL/SECAM switch on SECAM mode. On PAL/NTSC mode, the signal is subjected to the comb driver (COMB DRIVER AMP) and is fed out from IC7510 pin 20 to be supplied via an external trap (F1105 / C2560), IC7510-(22) and an internal amplifier to the PAL/SECAM switch. Subsequently, the signal is taken to a bandpass (BPF) and a playback amplifier with colour killer. With PAL and MESECAM the chroma signal is directly fed to the PAL/MESECAM - NTSC-switch. With the NTSC standard, the signal is fed out from pin 26 of the IC7510 and is then taken to the chroma standards converter IC7650-(14) which generates a Quasi-PAL-signal. This signal is fed out from pin 11 of the IC7650 and is passed through IC7510-(24) to the PAL/MESECAM - NTSC-switch. In the "Y-C-MIX" stage which follows it is added to the internally fed in Y-signal and subsequently, in the FBC-stage (Feedback clamp), it is clamped to the sync level.

Carrier preparation (PAL/NTSC)

– Record (PAL)

For carrier preparation use is made of a voltage-controlled quartz oscillator (VXO) in IC7510 the oscillating frequency (4.43361MHz) of which is determined by the quartz (Q1125) connected to pins 13 and 14. The REC-APC detector compares the phase of the transmitted burst with that of the VXO and controls the latter accordingly. This control voltage is provided on IC7510-(12) and is smoothed by C2668, R3877 and C2670. In addition, an oscillator (321FH VCO) is used which is integrated in IC7510 and controlled by the synchronizing frequency. The VCO oscillates at a multiple of the line frequency ($321f_H$) which corresponds to a frequency of 5.015625MHz. This frequency is divided first by 2 in a down counter (1/2) and then by 4 in a 4-phase shifter. Subsequently, it is fed to the sub-converter (SUB CONV) where it is mixed with the VXO oscillator frequency (4.43361MHz). The result is, among others, the subcarrier frequency of 5.06MHz. The subcarrier passes through an internal 5.06MHz bandpass and is then fed to the main converter (MAIN CONV).

– Playback (NTSC/PAL)

On playback use is made of the quartz frequency (Q1125 - 4.43361MHz) of the free running XO quartz oscillator as a reference, and of the VCO oscillator. After reconversion of the chroma signal from 627kHz (PAL) or 629kHz (NTSC) to the 4.43MHz subcarrier frequency the VCO is now synchronised by the burst of the played back chroma signal. The Pb-APC stage generates the control voltage for the VCO comparing the phase of the quartz oscillator with the phase of the reconverted 4.43 MHz burst. The time constant of the filter circuit which is connected to IC7510-(19) is determined by C2513, C2515 and R3680. In the down counter (1/2) and the 4-phase shifter (1/4), the frequency is divided by 8 and fed to the sub-converter (SUB CONV) where it is mixed with the XO oscillator frequency. The result is, among others, the subcarrier frequency of 5.06MHz. The subcarrier is supplied via an internal bandpass filter to the main converter (MAIN CONV).

2.5 Family Board – FM-Sound (AF)

As the stereo sound channels are symmetrically constructed, the description is confined to the left channel (L).

Function Overview

In the FM-sound circuit stage, on record mode, the audio signals are selected by the input selection switch and compressed. Subsequently, the two carrier frequencies (1.4MHz-Left Channel and 1.8MHz-Right Channel) are frequency-modulated with the audio signals and fed to the two rotating audio heads to be recorded onto the tape.

On playback, the rotating audio heads scan the information from the tape and this is fed to the FM-sound circuit stage. After demodulation the signals are expanded to the original dynamic range (noise reduction) and fed to the outputs (LINE, EURO-AV, Modulator).

2.5.1 Record

The input signals (LINE, EURO-AV, HF Sound) are present on the input selection switch of the IC7320. The selected AF signal (L) is fed through pin 47 to the standard sound circuit stage for longitudinal track recording. Simultaneously, the

selected AF-signal is taken to the internal lowpass filter (AUDIO LPF). After this lowpass, the signal is subjected to the compressor (compression by a factor 2) and a noise reduction stage (NOISE REDUCTION) to be passed on via IC7320-(2) / C2285 / IC7320-(1) to the audio limiting stage (AUDIO CLIPPER) for limiting the deviation. In the FM modulator "CCO", the AF-signal is converted to a 1.4MHz FM-signal. After the HF-lowpass filter (HF LPF), this signal is added to the 1.8MHz FM-signal form the right channel. In the following, the sum signal is amplified and passed on through IC7320-(56), T7335 and plug contact 1507-2 to the head amplifier.
When recording the two carrier frequencies onto tape, the HF ampli-tude of the 1.8MHz carrier is about 10dB higher, as this carrier is erased more severely by the following video head. This method ensures that the amplitude is approximately the same for both carriers on playback.
The IC7320 is controlled from the main computer IC7050 via the I²C-bus.

2.5.2 Playback

The signal from the tape is fed to the FM-sound circuit stage via 1507-6, passes through a bandpass filter F1075 where it is separated (1.4MHz Left Channel / 1.8MHz Right Channel) and is fed to IC7320-(61), -(55). Subsequently, the signals are fed through the HF limiters (FM LIMITER) to the demodulators (⌽). The demodulated AF signal (L) is fed through the "LOOP FILTER" to the Sample & Hold circuit (S&H). This circuit is used to suppress the interferences in the AF signal caused by changing the heads when scanning the signals from the tape. The necessary "Hold Switch Pulse" is generated in the IC7320 using the HI sound pulse. This pulse is supplied from the main computer IC7050-(14) to IC7320-(51). The AF-signal (L) is passed through IC7320-(2) / C2285 / IC7320-(1), the lowpass filter (AUDIO LPF) and the noise reduction (NOISE REDUCTION) to the output selection switches. The standard sound signal from the standard sound section is fed via IC7320-(33) to the output selection switch. The selected signals are added in the MIX-stage and passed on to the modulator via IC7320-(30). The selected output signal (L) is supplied via an output driver and IC7320-(27) to the outputs (LINE, EURO-AV). From the output selection switch for the headphones, the AF-signal is passed through a level control and IC7320-(22) to the headphone socket. Additionally, the AF-signal is fed through an AF- envelope rectifier and taken from IC7320-(31) to the main computer IC7050-(22). The main computer drives the level control indicator on the keyboard control unit via the serial interface and the keyboard control computer.
The IC7320 is controlled from the main computer IC7050 via the I²C-bus.

2.5.3 HiFi Sound Detection

The 1.4MHz component of the "FM from the tape" is fed from IC7320-(61) through the HF-limiting stage (HF LIMITER) to an evaluation circuit (LEVEL DETECT) which converts the FM envelope to a DC voltage. This DC voltage is proportional to the FM amplitude and is used as the actual value for the sequence control computer (IC7050), which obtains this information via IC7320-(11). If this level is above 2.2V, the HiFi sound recording is played back. If the level is below 2V the sequence control computer switches over to the standard sound. Additionally, this actual value is processed by an A/D converter and used for tracking indication.

2.6 Family Board – Standard Sound / Audio Linear (AL)

Function overview

On record, the AF signals processed in the FM-sound circuit stage are fed into the standard sound circuit stage to the record input IC7220-(11). The selected AF signal is processed in the standard sound circuit stage for longitudinal track recording.
On playback, the AF signal obtained from the R/P-head is amplified and then fed to the FM-sound circuit stage.
The individual operating modes are switched over as shown in the table below:

	REC	REC-Pause	PB	EE
$\underline{\text{U}}\uparrow\overline{\text{MUTE}}$-AL	0	1	0	0
$\overline{\text{EE}}\downarrow\underline{\text{PB}}$	1	1	0	1
$\overline{\text{REC}}\downarrow\underline{\text{EE}}$	1	0	0	0

2.6.1 Record

From the FM-sound circuit stage, the selected AF signal is fed via IC7220-(11) and an automatic level control stage (ALC) to a linear amplifier (LINE). The AF signal is taken from IC7220-(13) via C2252, R3340 and IC7220-(14) to the integrated record equalising amplifier (REC). It leaves the IC7220 on pin 17. The AF signal is added to the record bias current at the junction R3310 / R3312 and passes via the plug contact 1503-1 to the R/P-head. The other end of the R/P-head is connected to chassis by 1503-3 and IC7220-(2). The record bias voltage is adjustable with R3312 (BIAS).
For the "LP" function, switchover of the record equalising circuit is carried out by the switches EP CTL and LP CTL in IC7220.

2.6.2 Erase Oscillators

The oscillator for the full-track erase head consists of the transistor T7207 and the resonant circuit F1052 / C2205. The oscillator is operated from the switching voltage $\overline{\text{U}}\downarrow\underline{\text{WR-AL}}$-3 from the shift register IC7259-(4) and the transistors T7204 / T7203 which follow.
The oscillator for the sound erase head consists of the transistor CT7235 and the resonant circuit F1055 / C2232. From this oscillator also the bias voltage (BIAS) is derived. The sound erase head is operated by the switching voltage $\overline{\text{U}}\downarrow\underline{\text{WR-AL}}$-2 from the shift register IC7259-(7) and the transistors CT7243 / CT4242 which follow.
On recording, both the sound erase head and the full-track erase head are activated but only the sound erase head in dubbing mode.
Note: The full-track or sound erase head of video recorders which are not provided with the dubbing function is driven from an oscillator (CT7235 / F1055 / C2232).

2.6.3 Playback

On playback the R/P-head is connected to chassis via IC7220-(1) and the plug contact 1503-1. The AF signal picked up by the R/P-head is fed via 1503-3 to IC7220-(6), -(2). The signal passes in IC7220 through an integrated playback equalising stage (PB) and is then fed via IC7220-(8) and the level control for playback R3300 (LL) to IC7220 pin 9. Afterwards it is amplified in a linear amplifier (LINE). The

AF signal leaves the IC7220 from pin 13. After the capacitor C2252 the AF signal is fed to the FM-sound circuit stage for further processing.

On "LP"mode, switchover of the equalising circuit is carried out by the switches EP CTL and LP CTL.

2.6.4 Muting Circuit

The mute command from the shift register IC7259-(13) mutes the audio outputs of IC7220 in all functions, with the exception of playback and record, and also in the case of servo faults. For this, the IC7220 obtains the command U↓$\overline{\text{MUTE}}$-AL via pin 22. In addition, with the command U↓$\overline{\text{FRESH}}$ from the shift register IC7259-(14), the electrolytic storage capacitor C2250, which is part of the level control circuit (ALC - Automatic Level Control), is discharged via CT7250. On manual level control, this command is HIGH and as a result, the level control is not active.

2.7 Family Board – IN/OUT (IO)

General

The universal applicability of these video recorders require special facilities for distributing the input and output signals corresponding to the operating mode. For this, two matrix switch ICs (IC7355 / IC7410) or distribution resistors are used. In addition, the switch IC7420 serves the purpose of switching over from the video-CCVS-signal to the teletext-CCVS-signal.

2.7.1 Record, EE and Playback Modes

The signals are selected and distributed in the matrix switches. For the video signals it is the switch IC7410 and for the audio signals it is IC7355. These matrix switches are supplied with the input signals from the sources (EURO-AV1, EURO-AV2, LINE-Front, HF, EE/PB). The signals are selected according to the operating mode and fed to the circuit sections for video and sound processing and the output sockets, respectively.

The Cinch-Video signal (CV) from the keyboard control unit II is selected via pin 2 of IC7410 (active at LOW level) and the transistor network T7401 / T7400 / T7402.

The main computer IC7050 controls the matrix switches via the I^{2}C-Bus-A.

In the video recorders which are not fitted with matrix switches, the non-existent switches are bridged with resistors thus determining the distribution.

2.7.2 Decoder Operation

For financial and copyright reasons, a couple of private television stations transmit scrambled video and audio signals so that a Pay-TV-Decoder is required to descramble the signals.

Technical realization

The Pay-TV-Decoder is connected to the AV2 socket and the TV receiver to the EURO-AV1 socket.

This connection makes it possible to operate the Pay-TV-Decoder in combination with the TV receiver and also with the video recorder without changing the connections.

When using the video recorder, the coded video and audio signals are taken via the AV2 socket to the Pay-TV-Decoder. The Decoder descrambles the signals and feeds them back to the video recorder. This signal path must be released for the respective programmes when setting the programmes.

Used with a TV receiver, the coded video and audio signals are fed from the TV through the EURO-AV1 socket and the AV2 socket to the Pay-TV-Decoder where the signals are descrambled and then returned to the TV receiver via the AV2 socket and the EURO-AV1 socket.

The sets are interconnected by the matrix switch (IC7355 / IC7410).

3. NICAM Decoder (NI)

General information on NICAM

The NICAM (NEAR INSTANTANEOUS COMPANDED AUDIO MULTIPLEX) Transmission System is a digital stereo sound transmission technique.

This technique is a standard for sound transmission in television engineering. Compared to the conventional analog methods, this technology has allowed an appreciable improvement in the signal-to-noise ratio and the dynamic range to be achieved.

In a way similar to the analog stereo/ two-channel sound technology applied in Germany for example, also with NICAM, a digital sound/data signal is added with a separate carrier in addition to the conventional vision and sound signal. Apart from two digital sound channels of 10Bit each this digital signal contains scaling, identification as well as coding data for the stereo, mono, two-channel sound or the data transmission.

The total dynamic input range is divided into eight stages. The so-called "Scaling Factor" identifies the respective stage and serves as the multiplication factor for the 10Bit data word. Hence its name!

The scaling factor is determined every 2ms at a sampling rate of 32kHz and, together with the operational sign-bit, results in a dynamic total of 14Bit. With this method, the data rate is reduced to 704kBit/s compared to 896kBit/s of a real 14Bit transmission. To recover the loss of information, use is made of the statistical characteristics of the sound signal and the performance of the human ear.

Apart from this compressed data transmission, a further advantage of the Nicam-System is its low sensitivity to interference due to the use of 4PSK-Modulation (Phase Shift Keying = Phase Keying). This improvement in quality requires, however, an even more sophisticated design of the transmitter as well as the receiver.

To get a more detailed idea of this system than is possible with this brief description please refer to the appropriate literature.

NICAM signal processing

The sound-IF-signal is fed through plug contact 1525-2 and the amplifier stage T7015 to IC7050-(6). In IC7050 the signal passes through an A/D-converter, a QPSK-demodulator and a NICAM-decoder (DEMUX). Subsequently, the processed signals are taken to the D/A-converter (IC7065). In IC7075 / IC7090 and its peripheral circuit, the analog signals fed out from IC7065-(6), -(8) are subjected to the deemphasis stage (J17) and an active lowpass. Via the plug contacts 1525-3 and 1525-4 the audio signals are supplied to the IF-amplifier for further processing.

On IC7050-(4) the gain controlled voltage (AGC) is present which is smoothed in a filter circuit (R3028, C2028) and is used to control the sound-IF-signal via the transistor T7025.

The evaluation of the NICAM status (2 mono channels – two-channel sound, 1 mono channel / 1 data channel, stereo and NICAM-sound = analog sound) is carried out in the control interface of the IC7050.

4. Keyboard Control Units – M8 (DC)

Function Overview

The Keyboard Control Units consist of the following function groups:

Keyboard Control Unit I:

- 4Bit-Single-Chip Microcomputer
- LCD Controller with integrated Driver
- Liquid Crystal Display (LCD)
- Display Brightness Control
- Keyboard (keyboard matrix)
- IR-Receiver and Remote Control Evaluation
- Generation of the AV-1Switching Voltage
- LED Drive

Keyboard Control Unit IIA:

- Input Sockets for VIDEO, LINE, Microphone
- Output Socket for Headphones
- Socket for SYNCHRO EDIT Control
- Microphone Input Amplifier
- Level Controls for Headphones, Microphone and Recording

Keyboard Control Unit IIIA:

- Shuttle
- Jog with Pulse Processing
- Keyboard (keyboard matrix)
- LED Drive

4.1 4-Bit-Single-Chip Microcomputer

The mask-programmed 4Bit-Microcomputer (IC7085) works as a Slave Computer. It evaluates the commands fed in from the keyboard and the Jog-Shuttle, decodes the commands from the Infra-red Remote Control and controls the LCD display and the brightness of the display illumination via the two LCD drivers (IC7170, IC7180).

The communication with the main computer on the sequence control (IC7050) takes place on the data lines B-DATA-A, B-DATA-B, B-$\overline{\text{CLOCK}}$ and B-$\overline{\text{RESET}}$.

4.2 LCD Drive

The LCD display consists of 2 units each with 40 or 37 segments. One unit consists of 8 rear electrodes (Commons: BP1-2...BP1-8 / BP2-1...BP2-8) and 40 or 37 front electrodes (S1-1...S1-40 / S2-1...S2-37). Each of the two kinds of electrodes is operated by one controller with an integrated LCD-driver (IC7170 / IC7180) according to the time-multiplex method. Both controllers operate in parallel with IC7170 being the "Master" and IC7180 the "Slave". They are synchronised via the pins 31 (SYNC). The master and the slave controllers are operated in parallel via the control and data lines at the input ports D0...D3, CS, STB, C/D by µC IC7085 with voltage levels of +5V / 0V. In addition, both LCD-controllers or drivers are supplied with the clock frequency (1MHz square wave signal; level +5V / 0V) from the µC IC7085, port PCL. Via the read-in port P13 of the IC7085 the status (Busy) of the two LCD-controllers/drivers is identified. If the Busy-line is at 0V-level for more than 200µs, port P92 feeds out a HIGH-pulse of +5V causing the two controllers/ drivers to be reset.

The voltage divider at the connections VDD, VLC1...VLC5 and VSS generates the different LCD driving voltages. The voltage levels then present at the connections are:
VLC1 = 4V; VLC2 = VLC3 = 3V; VLC4 =2V; VLC5 = 1V.

The illumination of a symbol in the display depends on the voltage difference between the segment and the common. With a voltage difference of 8V (+4V / -4V) the symbol appears. For symbols which are not active the voltage difference is 2V (+1V / -1V).

To avoid electro-chemical reactions the LCD display is operated by an AC voltage, that is during one scanning cycle the polarity between the segment and the common is changed. The display is driven according to the time-multiplex method at a duty factor of 1:8, a dividing ratio of the LCD driving voltage of 1:4, and a repetition frequency (frame frequency) of approx. 130Hz.

4.3 Keyboard (keyboard matrix)

The keyboard (6 x 4 matrix) is divided up to two keyboard control units (I and IIIA) and works on the Scanning-Clock principle with a keyboard scanning period T_T ~ 31ms. The LOW-active scanning clock is fed out at the output ports (open collector) P40...P43, P50 and P51 of the IC7085 and supplied to the keyboard matrix. By the Low-active scanning clock read in at the input ports P70...P73 the µC IC7085 identifies which of the buttons in the keyboard matrix has been depressed.

If no button has been depressed, that is in quiescent condition, the input ports are connected to 5V via internal pull-up resistors.

4.4 IR-Receiver and Remote Control Evaluation

The integrated circuit IC7010 is a selective, gain-controlled amplifier with an integrated photo-diode. The IR-Receiver converts the received infra-red light (940nm) to electrical pulses which are then amplified and demodulated. On the Interrupt input port INT0 of the IC7085 the output signal from the IR-Receiver (IC7010) is read into the microcomputer as a pulse sequence at TTL level (0V / 5V) for further processing and bit decoding.

4.5 Display Brightness Control

At pins 20 /21, the keyboard control computer (IC7085) feeds out a sequence of pulses the repetition rate of which can be adjusted in 5 steps via the on-screen-display menu "Brightness". For adjusting the display background brightness the pulse sequence is supplied via the transistors T7090 / T7120, the operational amplifier IC7110 and the MOS field effect transistors T7105 / T7115 to the 5 bulbs (LA25901). The circuit includes a control stage (IC7110) which compensates for any fluctuations of the voltages -F1 and +F2 by means of the duty factor of the pulse sequence at IC7110-(1), -(7) so that variations in the brightness of the bulbs are eliminated. The transistors T7106 / T7108 serve the purpose of a protection circuit (VDE) to avoid too high a transverse current flowing through the field effect transistors T7105 / T7115 in the case of any failures (eg. defective IC7110).

4.6 Shuttle

The Shuttle on the keyboard control unit IIIA is a 2^4 binary coded rotary switch. During the ±80° rotation of the Shuttle, the LOW-active scanning clock (T_T = 31ms) fed out from port 102 (Open Collector) of the IC7085 is connected with the output contacts S1...S4 according to the angle of rotation of the Shuttle. The logic state of the output contacts S1...S4 is read in at the input ports P70...P73 of IC7085 for detecting the angle of rotation of the Shuttle.

When the Shuttle is not turned, a level of +5V is read into the input ports via internal pull-up resistors of the IC7085.

4.7 Pulse Processing for JOG-Commands

The JOG on the keyboard control unit IIIA is a double pulse switch that can be turned freely with a total of 10 lock-in positions per rotation. The two pairs of pulse generators are arranged so that, dependent on the sense of rotation, phase-shifted square wave voltages (+5V / 0V) are provided at the Jog contacts J1 and J2. These voltages are debounced and inverted in the transistor stages T7025 / T7035 in combination with C2028 / C2038.

As a result of the HIGH/LOW edges of the pulse sequence at the input ports P111 and P110 caused by every rotation of the Jog, the transistor stage T7155 generates at the collector needle-shaped pulses of +5V and a pulse duration of approx. 200...300µs. Each needle-shaped pulse at INT1 of IC7085 causes an Interrupt in the µC and the logic state at the input ports P111 / P110 is read in. From this pulse sequence the µC can identify the sense of rotation of the Jog.

4.8 Generation of the AV-1 Switching Voltage

The switching voltage $\underline{U}\!\uparrow\!\overline{\mathrm{AV}}$-1 present at the EURO-AV-socket 1, contact 8, with the 16:9 picture format is approx. 6V. It is released via P32 (LOW) of IC7085, T7055 / T7040 and D6050.

With the 4:3 picture format, this voltage is approx. 11V and is released via P20 (HIGH) of IC7085, T7045, the current limiter T7040 (I_{MAX} = 40mA) and D6040.

4.9 Microphone Input with Input Amplifier

The AF-signal from the microphone is amplified in IC7035 on the keyboard control unit IIA and is fed through plug contact 1518-9 to the standard sound circuit stage IC7220-11. The volume level of the microphone can be adjusted with R3.

The microphone socket 1906 and the Cinch socket 1904 are each fitted with one switch to detect whether a plug is connected. The voltages corresponding to the switch settings are coupled via R3005...R3015 and fed to the analog input port AN7 of the keyboard control computer IC7085. The internal A/D-converter converts this value to a digital signal. Subsequently, this information is supplied via the keyboard control bus to the sequence control computer IC7050. If no microphone is connected and the "Dubbing" function is not selected, the computer feeds out the switching voltage $\underline{U}\!\uparrow\!\overline{\mathrm{MUTE}}$-MICRO via the shift register IC7020-(13) in the sequence control. This voltage is fed to the keyboard control unit IIA via plug contact 1518-10 and the transistor T7040 switches the noise signal to chassis (muted).

4.10 Level Control for Recording and the Headphones

The record and headphone level control is realized by direct voltages via the adjustment controls R5 and R10 on the keyboard control unit IIA. These direct voltages are applied to the analog input ports AN4...AN6 of the keyboard control computer IC7085. The internal A/D-converters transform these values to a digital signal. Afterwards this information is taken via the keyboard control bus to the main computer IC7050 which controls via the I^{2}C-bus the volume level in the FM-sound circuit stage IC7320 accordingly.

5. Keyboard Control Units – M6/7 (DC)

Function Overview

The Keyboard Control Units consist of the following function groups:

Keyboard Control Unit I:

- 4Bit-Single-Chip Microcomputer
- Vacuum Fluorescent Display (VFD)
- Keyboard (keyboard matrix)
- IR-Receiver and Remote Control Evaluation
- Generation of the AV-1Switching Voltage
- LED Drive
- Shuttle
- Jog with Pulse Processing

Keyboard Control Unit II:

- Input Sockets for VIDEO, LINE
- Socket for Synchro Edit Control
- Level Control and Output Socket for Headphones

Keyboard Control Unit IIIC:

- Keyboard (keyboard matrix)

5.1 4-Bit-Single-Chip Microcomputer

The mask-programmed 4Bit-Microcomputer (IC7030) works as a slave computer. It evaluates the commands fed in from the keyboard and the Jog-Shuttle, decodes the commands from the infra-red remote control handset and drives the VFD- display.

The communication with the main computer on the sequence control (IC7050) takes place on the data lines B-DATA-A, B-DATA-B, B-$\overline{\mathrm{CLOCK}}$ and B-$\overline{\mathrm{RESET}}$.

5.2 VFD Drive

In principle, the display is a directly heated triode valve. The filament of the tube is used at the same time as the cathode. At the filament contacts F2 of the VFD-display the voltage EC of approx. -19.5V is present. At the filament contacts F1 there is a square wave voltage (120Hz) with a voltage deviation of approx. +5.8V / -5.8V as referred to the contacts F2 (reference). This deviation is obtained by switching over the voltages 〰 F1 and 〰 F2. This process is controlled via port PP0 (TTL-level) and the driver circuit T7110 / T7115 / T7118. During the LOW phase at port PP0, the transistor T7110 is conductive and a level of approx. -10.7V (reference - ground) is present at the base contacts of T7115 / T7118. The transistor T7115 is conductive and a voltage of approx. -13.7V can be measured at the contacts F1 of the VFD-display. During the HIGH phase of the control voltage at port PP0, the transistor T7110 is turned off. The voltage level at the base contacts of the transistors T7115 / T7118 is approx. -28.5V. T7118 is now conductive and a voltage of approx. -23.5V is present at the contacts F1 of the VFD-display.

The symbols of the VFD-display illuminate only if the electrons emitted from the cathode and accelerated by the grid strike the fluorescent layer of the anode (symbols).

The 16 grids (VFD-contacts 5...20) are driven by IC7030 via the ports T0...T15 and the 16 anodes (VFD-contacts 21...36) via the ports S0...S9 / S16...S21. The display drive is carried out in time multiplex mode at a duty factor of 1/16, a grid scanning period of T_P = 4.15ms and a voltage deviation of +5V / -31V.

A symbol label illuminates only if the respective anode and the surrounding grid are switched to +5V at the same time for a certain period during one scanning period.

During the time of the scanning period the anodes are not operated the ports T0...T15 / S0...S9, S16...S21 are connected to approx. -31V via internal pull-down resistors of the µC.

The brightness (Dimmer) of the VFD-display can be varied by changing the pulse duration of the grid control signals (T0...T15 of IC7030). The pulse duration is approx. 244µs at maximum brightness and reduces along with the brightness.

5.3 Keyboard (keyboard matrix)

The keyboard (6 x 4 matrix) is divided up to two keyboard control units (I and IIIC) and works on the Scanning-Clock principle with a keyboard scanning period T_T ~ 31ms. The LOW-active scanning clock is fed out at the output ports (open collector) P41...P43 and P50...P52 of the IC7030 and supplied to the keyboard matrix. By the Low-active scanning clock read in at the input ports P60...P63 the µC IC7030 identifies which of the buttons on the keyboard matrix has been depressed.

If no button has been depressed, that is in quiescent condition, the input ports are connected to 5V via internal pull-up resistors.

5.4 IR-Receiver and Remote Control Evaluation

The integrated circuit IC7020 or IC7021 is a selective, gain-controlled amplifier with an integrated photo-diode. The IR-Receiver converts the received infra-red light (940nm) to electrical pulses which are then amplified and demodulated. On the Interrupt input port INT0 of the IC7030 the output signal from the IR-Receiver (IC7020 or IC7021) is read into the microcomputer as a pulse sequence at TTL level (0V / 5V) for further processing and bit decoding.

5.5 Shuttle

The Shuttle is a 2^4 binary coded rotary switch. During the ±80° rotation of the Shuttle, the LOW-active scanning clock (T_T = 31ms) fed out from port 53 (Open Collector) of the IC7030 is connected with the output contacts S1...S4 according to the angle of rotation of the Shuttle. The logic state of the output contacts S1...S4 is read in at the input ports P60...P63 of IC7030 for detecting the angle of rotation of the Shuttle.

When the Shuttle is not turned, a level of +5V is read into the input ports via internal pull-up resistors of the IC7030.

5.6 Pulse Processing for JOG-Commands

The JOG is a double pulse-switch that can be turned freely with a total of 10 lock-in positions per rotation. The two pairs of pulse generators are arranged so that, dependent on the sense of rotation, phase-shifted square wave voltages (+5V / 0V) are provided at the Jog contacts J1 and J2. These voltages are debounced and inverted in the transistor stages T7140 / T7150 in combination with C2145 / C2155.

As a result of the HIGH/LOW edges of the pulse sequence at the input ports P83 and P82 caused by every rotation of the Jog, the transistor stage T7133 generates at the collector needle-shaped pulses of +5V and a pulse duration of approx. 200...300µs. Each needle-shaped pulse at INT1 of IC7030 causes an Interrupt in the µC and the logic state at the input ports P83 / P82 is read in. From this pulse sequence the µC can identify the sense of rotation of the Jog.

5.7 Generation of the AV-1 Switching Voltage

The switching voltage $\underline{U}$↑$\overline{AV}$-1 present at the EURO-AV-socket 1, contact 8, with the 16:9 picture format is approx. 6V. It is released via P70 (LOW) of IC7030, T7060 / T7055 and D6055.

With the 4:3 picture format, this voltage is approx. 11V and is released via P71 (HIGH) of IC7030, T7050, the current limiter T7045 (I_{MAX} = 40mA) and D6045.

5.8 Switching voltages of the EURO-AV and LINE sockets

The voltage AV_{DD} (+5V) / AV_{SS} (ground) is supplied via the voltage divider (R3010 / R3025) to the socket switching contacts "LINE FRONT" on the keyboard control unit IIB. Dependent on the setting of the switching contacts a dc voltage (U-Cinch) is produced which is applied to the analog input AN5 of the µC (IC7030).

The dc voltages from the EURO-AV-sockets (up to +12V) $\underline{U}$↑$\overline{AV}$-1 and $\underline{U}$↑$\overline{AV}$-2, respectively, are divided by the voltage dividers R3067 / R3068 and R3063 / R3065, respectively, and fed to the analog inputs AN4 / AN3 of the µC.

The internal A/D-converter of the µC converts the dc voltages to digital information and passes this on via the keyboard control bus to the main computer (IC7050) for evaluation.

5.9 Level Control for Recording and the Headphones

The headphone level control is realized with a direct voltage via the adjustment control R5 on the keyboard control unit IIB. This dc voltage is applied to the analog input port AN2 of the keyboard control computer IC7030. The internal A/D-converter transforms this value to a digital signal. Afterwards this information is taken via the keyboard control bus to the main computer IC7050 which controls via the I^2C-bus the volume level in the FM-sound circuit stage IC7320 accordingly.

Adjustment Procedures

1. Power Supply (PS)

Test equipment: Digital Voltmeter.

Adjustment "$+12V_D$", R3090

- Digital voltmeter: MP ▽1
- Playback.
- Adjust voltage to **12V ±0.1V** with **R3090.**

2. Family Board

2.1 Family Board – Sequence Control / Deck Electronic (DE)

Test equipment: Oscilloscope, 10:1 Test Probe, Frequency Counter

Service work after changing the

- **IC7060:** Adjustment no. 2.1.1, 2.1.2, 2.1.3, 2.4.5
- **IC7058:** Adjustment no. 2.3.6, 2.3.7

2.1.1 Initializing the RAM (IC7060)

- Press the buttons "Standby" and "Eject" simultaneously on the recorder for approx. 5s and connect the mains plug.

Service Work after this adjustment:

- Adjustment no. 2.4.5 (Studio Picture Control)
- Adjustment no. 2.1.2 (Headwheel Position Indicator).

2.1.2 Headwheel Position Indicator

- Load a test cassette.
- Call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- Press the button "3".
  During the automatic adjustment of the headwheel position indicator the display shows "L3". After successful adjustment "E" appears in the display.
- To cancel the service function: Mains reset or press the "Standby" button.

2.1.3 Clock, C2060

- Connect IC7060-(7) to $+5V_D$ via a 10kΩ resistor.
  Frequency counter: IC7060-(7).
- Standby.
- Set clock period to **1s ±4µs** via **C2060**. Remove the 10kΩ resistor.

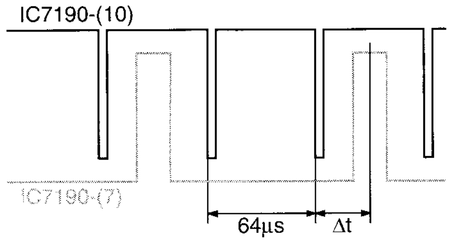
2.2 Family Board – Teletext "DOS" (OS)

Test equipment: Two-channel Oscilloscope, 1:1 Test Probe (TK)

2.2.1 H/2 Sync Adjustment, F1040

(after replacing the F1040 or C2167)

- Oscilloscope: Channel 1: IC7190-(10)
  Channel 2: IC7190-(7)
  Trigger: Channel 2, negative going edge.
- Feed in a HF signal (PAL) / Record or EE mode without Texttable.
- Set the time interval with **F1040** between the middle of the H/2-SYNC (IC7190-(7)) pulse and the negative going edge of the SYNC (IC7190-(10)) to **Δt = 32µs ±10µs.**



2.3 Family Board – Frontend (FE)

Test equipment: Oscilloscope (>50MHz), 10:1 Test Probe, Voltmeter, Colour Generator with Stereo Coder, Distortion Factor Meter.

2.3.1 Vision Demodulator Circuit, F1175 (AFC-ADJ)

- Feed in a TV standard test pattern (upper UHF-range, Ch26).
  Voltmeter: MP ▽86
- Fine Tuning Mode
- Set the voltage with **F1175 (AFC-ADJ)** to **2.5V ± 0.5V.**

2.3.2 Delayed AGC Voltage, R4140 (AGC-ADJ)

- Solder a 4.7pF capacitor to MP ▽87.
  Connect the oscilloscope with 10:1 test probe to the capacitor.
  Feed in a standard test pattern without audio modulation (upper UHF-range, Ch26, 67dBµV aerial signal) into a warmed-up set.
  Oscilloscope with 10:1 test probe: MP ▽87
- EE mode
- Set the amplitude with **R4140 (AGC-ADJ)** to **$150mV_{PP}$**.
- Unsolder the 4.7pF capacitor.

2.3.3 Quasi-Split-Sound (QSS), F1145 (REF-ADJ)

- Feed in a standard test pattern (upper UHF-range, Ch26, 67dBµV aerial signal) into a warmed-up set.
  Distortion factor meter (or oscilloscope) with 10:1 test probe: MP ▽82
- EE mode
- Set the distortion with **F1145 (REF-ADJ)** to **Minimum** (or adjust for best sine wave possible).

2.3.4 FM-Demodulator (FM-Sound 1), F1155 (FM1-ADJ)

- Feed in 2-channel standard test pattern with colour generator, 1kHz sine, ±27kHz deviation.
  Distortion factor meter (or oscilloscope): MP ▽82
- EE mode.
- Set the distortion with **F1155 (FM1-ADJ)** to **Minimum**
- (or adjust for best sine wave possible).

2.3.5 FM-Demodulator (FM-Sound 2), F1180 (FM2-ADJ)

- Feed in 2-channel standard test pattern with colour generator, 1kHz sine, ±27kHz deviation.
  Distortion factor meter: MP ▽83
- EE mode.
- Set the distortion with **F1180 (FM2-ADJ)** to **Minimum**
- (or adjust for best sine wave possible).

2.3.6 Cross Talk

- Feed in a standard test pattern with sound modulation (stereo).
- Oscilloscope: MP 82
- Call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- RF-REC
- Set the **cross talk** to **Minimum**:
  Coarse: with remote control button "1" (+), "2" (-)
  Fine: with remote control button "3" (+), "4" (-)
- To cancel the service function: Press the "Standby" button or disconnect the recorder from the mains.

2.3.7 ATS-Adjustment

- Feed in a standard test pattern (upper UHF-range, Ch26, 50dBµV aerial signal).
- Call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- RF-REC
- Press the button "7". The display shows "L7".
- To cancel the service function: Press the "Standby" button or disconnect the recorder from the mains.

2.4 Family Board – Video (VS)

Test equipment: Oscilloscope, 10:1 Test Probe, Frequency Counter, Stabilized Power Supply, Colour Generator, Test Cassette.

2.4.1 EE-Level / Sync-Level Control, R3635 (EE)

- Feed in a white test pattern (100% white, $1V_{PP}$, 0.3V sync component, 0.7V CVS component).
  Oscilloscope: MP 31
- AV recording.
- Set amplitude with **R3635 (EE)** to **$0.5V_{PP}$**.

2.4.2 Frequency Deviation

Sync Value, R3752 (SV)

- Unsolder C2605.
  Frequency counter: MP 32
- AV recording.
- Set frequency counter with **R3752 (SV)** to **3.8MHz.**
  Solder in C2605.

White Value, R3755 (WV)

- Frequency counter: MP 32
  Oscilloscope: Channel A: IC7510-(42),
  Channel B: Marking beam
  Trigger: IC7510-(33),
  Switch oscilloscope to DC.
- AV recording.
- Mark the white value of the CVS signal with the unused beam B of the oscilloscope.
  Unsolder C2605.
  Power Supply: Connect positive (0V) to IC7510-(42)
  via a diode; cathode of the diode to pin 42.
  Connect negative to chassis.
  Increase the voltage of the power supply slowly, till both beams coincide.
  Set frequency counter to **4.85MHz** with **R3755 (WV).**
  Solder in C2605.

2.4.3 Video Record Voltage, R3707 (YWV)

- Oscilloscope: MP 42
- AV recording.
- Set FM signal with **R3707 (YWV)** to **$0.3V_{PP}$**.

2.4.4 Playback Amplitude, R3768 (PBA)

- Oscilloscope: MP 33
- Play back a white test pattern (self-made recording).
- Set amplitude with **R3768 (PBA)** to **$2V_{PP}$**.

2.4.5 FM-Reference Level Adjustment for Studio Picture Control

- Playback
- Call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- Press the button "1". The display shows "L1".
- To cancel the service function: Press the "Standby" button or disconnect the recorder from the mains.

2.5 Family Board – Chroma (VS)

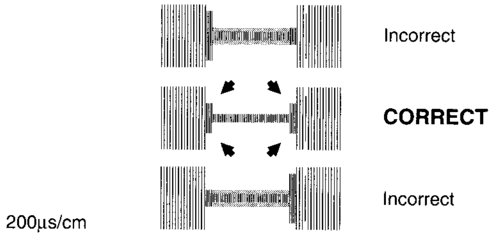
Test equipment: Oscilloscope with 10:1 Test Probe.

2.5.1 Chroma Record Current, R3693 (CWV)

- Connect the hot end of C2552 to ground.
  Feed in a colour bar test pattern.
  Oscilloscope: MP 42
- Record.
- Set amplitude with **R3693 (CWV)** to **$90mV_{PP}$**.
- Remove the short circuit.

2.5.2 627kHz Comb Filter, R3918 (CF)

- Oscilloscope: MP 41, Trigger: HI pulse 1506-3.
- Play back a self-made recording (red area test signal).
- With **R3918 (CF)** set the signal as shown in the oscillograms below.



2.5.3 H-PLL, R3858 (H-PLL)

- Frequency counter: MP 43
  Connect IC7650-(15) with $+5V_F$.
- With **R3858 (H-PLL)** set the frequency to **15600Hz.**
  Disconnect IC7650-(15) from $+5V_F$.

2.6 Family Board – FM Sound (AF)

Test equipment: Oscilloscope, 10:1 Test Probe, Frequency Counter, AF Generator, AF Millivoltmeter, Service-Test Cassette.

Service work after replacing the headwheel:
Adjustment no. 2.6.3

2.6.1 Carrier Frequency (after replacing the IC7320)

Left channel, R3402 (CFL)

- Frequency counter: MP ▽21
- Load a cassette, call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- Press the button "5". The display shows "L5".
- Do not feed in an AF signal! HiFi record.
- Set frequency with **R3402 (CFL)** to **1.4MHz ±5kHz.**
- To cancel the service function: Press the "Standby" button or disconnect the recorder from the mains.

Right channel, R3435 (CFR)

- Frequency counter: MP ▽21
- Load a cassette, call up the service function: Press the "STOP" button on the remote control handset and the "▶" button on the recorder simultaneously for approx. 5s. The display shows "E".
- Press the button "6". The display shows "L6".
- Do not feed in an AF signal! HiFi record.
- Set frequency with **R3435 (CFR)** to **1.8MHz ±5kHz.**
- To cancel the service function: Press the "Standby" button or disconnect the recorder from the mains.

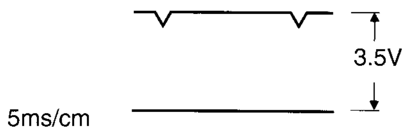
2.6.2 Playback Amplitude, R3390 (PBL)

(after replacing the IC7320)

- AF millivoltmeter: Audio → Left (L) / → Right (R)
- Play back the test cassette (HiFi).
- Set output voltage with **R3390 (PBL)** to **$50mV_{rms}$ ±0,5dB.**

2.6.3 Voltage of the FM-Envelope, R3455 (FME)

- Oscilloscope: MP ▽22
- Play back the test cassette (HiFi).
- With **R3455 (FME)** set the voltage as shown in oscillogram below.



2.6.4 Voltage of the Sound Envelope

Left channel, R3385 (AEL)

- Oscilloscope: MP ▽23
- HiFi record, automatic level control (eg. with "ORT").
- Set DC voltage with **R3385 (AEL)** to **1.5V.**

Right channel, R3380 (AER)

- Oscilloscope: MP ▽24
- Set DC voltage with **R3380 (AER)** to **1.5V.**

2.7 Family Board – Standard Sound / Audio Linear (AL)

Test equipment: Oscilloscope, 10:1 Test Probe (TK), Frequency Counter, AF Millivoltmeter, AF Generator, Trademarked Chromium Dioxide Cassette.

Service work after replacing the RP-Head:
Adjustment no. 2.7.1...2.7.4

2.7.1 Sound Erase Frequency, F1055 (FAEH)

- Frequency counter, 10:1 test probe: MP ▽13
- Record.
- Set frequency with **F1055 (FAEH)** between **59kHz** and **65kHz.**

2.7.2 Full Track Erase Head, F1052 (FFEH)

- Frequency counter, 10:1 test probe: MP ▽14
- Record.
- Set frequency with **F1052 (FFEH)** between **59kHz** and **65kHz.**

2.7.3 Bias (VM), R3312 (BIAS)

- Oscilloscope, 10:1 test probe: MP ▽13
- Record.
- With **R3312 (BIAS)** alter the voltage between **$22V_{pp}$** and **$62V_{pp}$** until the frequency response is linear.

Checking Frequency Response

- Feed an audio signal of $10mV_{rms}$ ($28mV_{pp}$) from the AF generator to the LINE IN socket → (on the rear side of the recorder).
- Make a recording at 400Hz and 8kHz, at least 1 min duration, of each frequency. Afterwards play back these recordings.
- Connect an AF millivoltmeter (oscilloscope) to EURO AV socket pins 1 / 3 or Audio →.
- The voltage ratio of 400Hz to 8kHz must not be greater than 1:0.7 or 0.7:1 (±3dB). If the voltage ratio exceeds these limits, the bias must be altered:
  To increase the playback voltage of 8kHz: Reduce bias (VM).
  To reduce the playback voltage of 8kHz: Increase bias (VM).

2.7.4 Playback Level, R3300 (LL)

- AF generator : Audio → Left (L) → / Right (R)
  Feed in 333Hz / $0.5V_{rms}$
  AF millivoltmeter: Audio → Left (L) / → Right (R)
- HiFi -EE-mode, auto recording (Normal play)
  Play back this recording (switch over to standard sound).
- Set output voltage with **R3300 (LL)** to **$0.5V_{rms}$.**

(D) Hinweis zu den Bauteilen:

Verschiedene Bauteile sind mit einem " X " oder mit einem " Y " gekennzeichnet. Es handelt sich hierbei um Bauteile, die nicht in allen Gerätetypen enthalten, sondern vorgesehen (X) oder variantenbezogen sind (Y). Die variantenbezogenen Bauteile sind den Features zugeordnet (siehe Feature-Übersichten).

(GB) Note on the components:

Various components are marked with the letter " X " or " Y ". These letters are used to identify components which are not common to all types of recorders but either planned to be fitted (X) or used only in certain variants (Y). The components used for different variants are allocated to the features (see features lists).

(F) Information sur les composants:

Certains composants sont identifiés par un " X " ou un " Y ". Il s'agit ici de composants qui ne sont pas montés dans tous les modèles d'appareils, mais de composants prévus (X) ou des variantes (Y). Les variantes de composants sont affectées aux diverses versions d'équipements (voir tableaux des versions d'équipements).

(I) Nota sui componenti:

Diversi componenti sono contrassegnati con una " X " oppure con una " Y ". Si tratta di componenti che non sono presenti in tutti gli apparecchi, ma previsti (X) oppure varianti (Y). I componenti riferiti alle varianti sono associati alle varie caratteristiche (vedi elenco caratteristiche).

(E) Advertencia sobre los componentes:

Diferentes componentes estàn marcados con una " X " o con una " Y ". Se trata de componentes no contenidos en todos los modelos de aparatos, sino sólo previstos (X) o variantes (Y). Los componentes relacionados con las variantes se encuentran referenciados en las Features (Ver indice de Features)

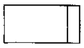
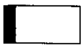
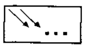
(NL) Aanwijzing voor componenten:

Verschillende componenten zijn met een " X " of met een " Y " aangegeven. Het gaat hierbij om com-ponenten die niet in alle modellen aanwezig zijn, maar mogelijk zijn (X) of afhankelijk zijn van het type verwant (Y). De componenten die type afhankelijk zijn, zijn bij de Features aangegeven (zie hiervoor features overzicht).

(D) Schaltplansymbole / (GB) Circuit diagram symbols / (F) Symboles schema (I) Simboli sullo schema / (E) Simbolos en los esquemas / (NL) Schema symbolen

Schaltplansymbole für Video-/Chromasignale und Statusbefehle.
Circuit diagram symbols for video signals, chroma signals and status commands.
Symboles schema pour video / chroma et status de commandes.
Simboli per segnali video, chroma e situazioni di comando.
Símbolos de senales de video y croma de los status de mando.
Schema symbolen voor video-/kleursignalen en status commandos.

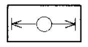
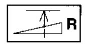
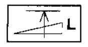
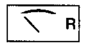
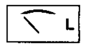
Unterschiedliche Signale auf einer Leitung/Various signals on one lead/Signaux different sur le même cable/Segnali differenti su una linea/Senales differentes en lu conduccion/Verschillende signalen op één leiding:

	– Aufnahme / Record / Enregistrement / Registrazione / Grabacion / Opname
	– Wiedergabe / Playback / Reproduction / Reproduzione / Reproduccion / Weergave
U TUN. UST 0 - 9V	Abstimmspannung / Tuning voltage / Tension d´accord / Tensione di sintonia / Tension de sintonia/ Afstemmings spanning (voltage)
	Optokopplerimpulse / Optocoupler pulses / Impulsions tachymetriques / Impulsi optoaccoppiatore / Impulsos tacometricos / Optocouplerpuls
U LP NP LP	Longplay-Umschaltung / Longplay switchover / Commutation longue duree / Commutazione longplay / Commutacion a longplay / Longplay-omschakeling
U REC U REC	Aufnahme-Status / Record status / Status enregistrement Stato di registrazione / Status de grabacion / Opname status
U RHF	HF- Aufnahmespannung / RF record voltage / Tension d´enregistrement HF / Tensione di registrazione HF / Status de grabacion RF / HF-Opname spanning
U PB PB	Wiedergabe-Status / Playback status / Status reproduction / Status reproduzione / Status reproduccion / Weergave status
U RE	RE-Status / RE status / Status RE / Stato RE / Status RE / RE status
U TEST	Schaltspannung für Testbildgenerator / Switching voltage for test pattern generator / Tension de commutation mire / Tensione di commutazione per generatore di prova / Activacion del generador de prueba / Schakel spanning voor testbeeld generator
U PAY-TV	Pay-TV-Schaltspannung / Pay TV switching voltage / Tension de consommation/tele à péage / Tensione di commutazione TV a pagamento / conmutacion a TV de peaje / Pay TV schakelspanning
U PS	Regelumschaltung bei BSL / Control switching during picture search / Tension de commutation en recherche visuelle / Tensione di regolazione durante la ricerca immagine / Conmutacion a busqueda de imagen / Controle omschakeling tijdens picture search
U BD III	BD. III-Umschaltung / BD. III switch-over / Commutation bande III / Commutazione banda III /Conmutacion banda III / BD. III omschakeling
U I / III	BD. I/III-Umschaltung / BD. I/III switch-over / Commutation bande I/III / Commutazione banda I/III Conmutacion banda I/III / BD.I/III omschakeling
U VHF	VHF-Umschaltung / VHF switch-over / Commutation VHF / Commutazione VHF / Conmutacion banda VHF / VHF-omschakeling
U UHF	UHF-Umschaltung / UHF switch-over / Commutation UHF / Commutazione UHF / Conmutacion banda UHF / UHF-omschakeling
HF AV	HF/AV-Umschaltung / RF/AV switch-over / Commutation HF/AV / Commutazione HF/AV / Conmutacion banda HF/AV / HF/AV-omschakeling
U AV U EURO-AV	AV-Schaltspannung / AV switching voltage / Tension de commutation AV / Tensione di commutazione AV / Tension de conmutacion AV / AV schakelspanning
U AV-I	Status f. Schaltspannung an AV-I / Status for the switching voltage on AV-I / Statut de tension de commutation sur la prise péritélévision / Condizione per tens. di commutaz. su AV-I / Status para tensión de conmutactión en AV-I / Schakelspanning AV-I
U AV-II	Auswertung einer externen Schaltspannung / Evaluation of an external switching voltage / Analyse d'une tension de commutation externe / Valutazione di una tens. di commutaz. esterna / Evaluación de una tensión de conmutación externa / Herkenning van een externe schakelspanning

U AV-III	Schaltspannung an AV-I (abhängig v. d. Auswertung d. U-AV-II) / Switching voltage on AV-I (dependent on the evaluation of U-AV-II) / Tension de commutation sur la prise péritélévision I (dépendant de l'analyse de la tension de commutation sur la prise péritélévision II) / Tensione di commutazione su AV-I (in base alla valutazione di U-AV-II) / Tensión de conmutación en AV-I (pendiente de la analización de U-AV-II) / Schakel spanning op AV-I (afhankelijk v.d. verwerking v.d. U-AV-II)
CV HF	CV/HF-Umschaltung / CV/RF switch-over / Commutation CV/HF / Commutazione CV/HF / Conmutacion banda CV/HF / CV/HF-omschakeling
HF/CV AV	HF/CV-AV-Umschaltung / RF/CV-AV switch-over / Commutation HF/CV-AV / Commutazione HF/CV-AV / Conmutacion banda HF/CV-AV / HF/CV-AV-Omschakeling
U CV U CV	Status CV / Etat CV / Condizione CV / Status CV /
U AFB U WR	Schaltspannung bei Aufnahme / Switching voltage for record / Tension de commutation en enregistrement / Tensione commut. in registrazione / Tension de conmutacion conmutacion en grabacion / Schakel spanning voor opname
U FCT	Funktion-Ein-Status / Function "ON" status / Statut marche / Funzione inserita / Activacion tension / Functie „ON" status
F1 F2	Heizung F1/F2 / Filament F1/F2 / Filamento F1/F2 / Gloeispanning F1/F2
U WM1 U WM2	Steuerspannung Wickelmotor / Control voltage, winding motor / Tension de commande moteur / Tensione di comando motore avvolgimento / Tension de mando del motor / Stuurspanning spoelmotor
U CM	Steuerspannung Capstanmotor / Control voltage, capstan motor / Tension de commande moteur cabestan / Tensione di comando motore capstan / Tension de mando del motor del capstan / Stuurspanning capstanmotor
U HWM U HWM	Steuerspannung Kopfradmotor / Control voltage, headwheel motor Tension de commande moteur tambour de têtes / Tensione di comando motore ruota testine / Tension de mando del motor del volante de cabezas / Stuurspanning drummotor
C-F R	Drehrichtung Capstan Motor / Sense of Rotation / Sens de rotation du moteur cebestan / Verso rotoz. Motore Capstan / Sentido de giro motor capstan / Draairichting Capstanmotor
TS	Bandanfang / Start of tape / Debut de bande / Inizio nastro / Principio de cinta / Begin band
TE	Bandende / End of tape / Fin de bande / Fine nastro/ Final de cinta / Einde band
TS TE	Bandanfang-/Bandende-Kennung / Tape start/tape end detection Identification debut/fin de bande / Identificazione inizio/fine nastro/ Identification de principio o fin de cinta / Begin band-/einde band detectie
U THR	Einfädeln / Threading / Engagement de bande / Caricamento del nastro / Enhebrado / Inrijgen
U UTHR	Ausfädeln / Unthreading / Degagement de bande / Scaricamento del nastro / Desenhebrado / Uitrijgen
U HEIM	Heimlauf / Automatic unthread on switch off / Degament auto.par inter M/A / Sgancio autom. con spegnimento / Desenhebrado preventivo / Automatisch uitrijgen bij uitschakelen
U TT	Bandzug-Spannung / Tape tension voltage / Tension de bande / Tensione nastro / Tension de cinta / Tapetension regelspanning
U DOS	Umschaltung DOS-/Video-Bild / DOS-CCVS/picture switch-over / Commutation DOS-Vidéo / Commutazione Video/DOS / Conmutación DOS/imagen de video / Omschakeling DOS-/video beeld
U DOS REC.	Untertitelaufnahme / Subtitle Recording / Enregistrement des sous-titres / Registrazione sottotitoli / Grabación de subtitulos / Ondertitel opname
U BOX/ SEC. U BOX/ SEC.	Schaltsignal bei DOS- bzw. OSD-Einblendungen in ein SECAM-Signal / Switching signal with DOS or OSD superimposed on a SECAM signal / Tension de commutation DOS ou OSD en SECAM / Tensione di commutazione con sovrapposizione DOS (OSD) in un segnale Secam / Tensión de conmutación de DOS o inserciones OSD sobre una señal SECAM / Schakelsignaal bij DOS of OSD invoeging in een SECAM signaal
AGC-DOS	Regelspannung für MENUE-Signalbalken / Control voltage for MENU signal bar / Tension de régulation pour les signaux menu et mire / Tensione di regolazione per barre segnale MENU' / Tensión de regulación para barras de señal MENU / Regelspanning voor menu-signaalbalken
U VPS VT	Status VPS/Videotext / Status VPS/Teletexte / Stato VPS/Televideo / Status VPS/Teletexto / Status VPS/teletekst
DS	Drum Stop-Pegel / Drum Stop Status / Niveau (tambour de tete arrete) / Livello stop tamburo / Nivel de detención del tambor / Drum stop status
B	Blau / Blue / Bleu / Blu / Azul / Blauw
R	Rot / Red / Rouge / Rosso / Rojo / Rood
G	Grün / Green / Vert / Verde / Groen
U WR-V U WR-V	Bild-WR-Status / Video WR status / Status WR Video (enregistrement/lecture) / Stato Video / Status grabacion/ reproduccion Video / Beeld WR status
HI - P	Kopfumschaltimpuls-Bild / Video head switching pulse / Impulsion de commutation tete image / Impulso di commutazione testina video / Conmutacion de cabezas de video / Video head switching puls
SP - HI	Kopfumschaltimpuls-Standbild / Head switching pulse for freeze frame / Impulsion de commutation pour "Arrêt sur image" / Impulso commutaz. testine per fermo immagine / Impulso de conmutación de cabezas en paro de imagen / Video head switching puls voor stilstaandbeeld
HI - CH	Kopfumschaltimpuls-Chroma / Chroma head switching pulse / Impulsion de commutation tete/chroma / Impulso di commutazione testina Croma / Conmutacion cabezas de croma / Video head switching puls chroma
SP	Standbild / Still picture / Arrêt sur image / Fermo immagine / Imagen parada / Stilstaand beeld / Stilstaand beeld optimalisering
SP-OPT	Standbildoptimierung / Freeze frame optimisation /Optimisation de l' arrêt sur image / Ottimizzazione fermo immagine / Optimización de la imagen fija
ROCL	Auslesetakt/Read out clock/Frequence de echanti´llonage/Cadenza di analisi Frecuencia de lectura / Systeem clock
▭	Rahmen / Frame / Cadre / Cornice / Marco / Frame
PIP ▭	Bild im Bild/Picture in picture/Image en image/Immagine nell´immagine/Imagen en imagen / Beeld in beeld
FM - P	FM-Bild / FM picture / Image - FM / Immagine FM / FM de imagen / FM-Beeld
U BS	Bildspeicher-Status / Field Memory Status / Status mémoire images / Status memoria immagine / Status memoria de imagen / Beeldgeheugen status
MIX.SYN	Synchrongemisch / Mixed sync. / Signeaux synchro / Sincronismo O/V / Sincronismos H / V / Mixed synchroon
Y Y	Y-Eintastung / Y insertion / Insertion Y / Inserimento Y / Insercion Y/ Y-insertion
V	V-Eintastung / V insertion / Insertion V / Inserimento V / Insercion V/ V-insertion
U V	Freigabe für V-Eintastung / Field insertion enable / Validation impulsion V / Consenso per inserimento V / Habilitacion insercion V/ Vrijgave voor V-insertion
F	Bildimpuls / Field pulse / Impulsion trame / Impulso di quadro / Impulsos de cuadro / Beeld puls
V-SYNC	Bild- oder eingetasteter V-Impuls / Vertical sync pulse or inserted V-pulse / Signal synchro vertical image ou signal synchro vertical artificiel / Imulso sincro verticale oppure inserimento sincro verticale / Impulso vertical o impulso de sincro vertical / Raster- of inserted V-puls
U H H	Zeilen-Eintastung / Line insertion / Insertion ligne / Inserimento di riga / Insercion de linea / Line insertion
CTL SYN	Synchronimpuls / Sync pulse / Impulsion Synchro / Impulso di sincronismo / Impulsos de sincronismo / Sync.puls
U KOIN. U KOIN.	Koinzidenz-Spannung / Coincidence voltage / Tension de coincidence / Tensione di coincidenza / Tension de coincidencia / Coïncidence spanning
U DOK	Dropout-Killerspannung / Dropout Killer Voltage / Tension de commutation dropout / Tensione di soppressione dropout / Tension de conmutacion dropout / Dropout killerspanning
U DOA	Dropout-Abschwächung / Dropout attenuation / Attenuation dropout / Attenuazione dropout / Atenuacion dropout / Dropout verzwakking
IF	ZF-Signal / IF signal / Signal FI / Segnale FI / Senal de FI / MF-signaal
CCVS	FBAS-Signal / CCVS signal / Signal Video-composite / Segnale FBAS (Video composito) / Senal completa de Videocolor / FBAS-signaal
CVS	BAS-Signal / CVS signal / Signal Video / Segnale BAS (Video) / Senal completa de Video / BAS-signaal

CH	Farbsignal / Chroma signal / Signal chroma / Segnale croma / Senal de croma / Chromasignaal
627 kHz	627kHz-Signal (PAL) / 627kHz Signal (PAL) / Signal 627kHz (PAL) / Segnale a 627kHz (PAL) / Senal de 627kHz (PAL) / 627kHz signaal (PAL)
1.1 MHz	1,1MHz-Signal (SECAM) / 1.1MHz Signal (SECAM) / Signal 1,1MHz (SECAM) / Segnale a 1,1MHz (SECAM) / Senal de 1,1MHz (SECAM) / 1,1MHz signaal (SECAM)
U CH EP	Chroma Hüllkurve (Video) / Chroma envelope (Video) / Courbe envelopante chroma (Video) / Curva d´inviluppo chroma (Video) / Chroma-curva envolvente de video / Chroma pakket
FSC	Hilfsträgerfrequenz / Subcarrier frequency / Frequence de la sous-porteus / Frequenza portante ausil. / Frecuencia de portadora auxiliar / Subcarrier frequentie
$2F_{SC}$	Doppelte Hilfsträgerfrequenz / Double subcarrier frequency / Frequence double de la sous-porteus / Frequenza portante ausil. doppia / Doble frecuencia de portadora auxiliar / Dubbele subcarrier frequentie
BK	Burst-Key-Impuls / Burst Key pulse / Impulsion Burst-Key / Impulso Burst-Key / Impulsos de puerta de Burst / Burst Key puls
U PAL	PAL / NTSC
U FMPI	FM-Bild-Kennung / FM picture identification / Identification Video/ FM / Identificazione Video/FM / Identificacion FM imagen / FM picture identificatie
AM FM FM AM	AM/FM-Umschaltung / AM/FM switch over / Commutation AM/FM / Commutazione AM/FM / Conmutacion AM/ FM / AM/FM-omschakeling
⊥	Masse / Chassis / Massa / Masa / Massa
*⊥	Separate Masse / Separate chassis connection / Connection de masse separee / Massa separata / Conexion de masa separada / Separate massa
CAM	Camera
U COL B-W	Schwarz/Weiß-Farbe Schaltspannung/ Black/White-Colour Switching Voltage/ Tension de commutation noir/blanc -color / Tens. commut. bianco/nero-colore/ Tensión de conm. b/n-colore / Zwart/ Wit-kleur omschakel spanning
U SW U SW	Schwarz/Weiß-Schaltspannung/ Black/White-Switching Voltage/ Tension de commutation noir/blanc/ Tens. commut. bianco/nero/ Tensión de conm. b/n / Zwart/Wit schakelspanning
CON.FM	Geregelte FM / Controled FM / FM réglée / FM regolata / FM Regulada / Geregelde FM
UNC. FM	Ungeregelte FM v. Band / Uncontrolled FM from the tape / FM de bande non contrôlé / FM non regolata da nastro / no areglado FM de la cinta / Ongeregelde FM van tape
U STAND	Normumschaltung / Standard switch - over / Commutation norme / Commutazione de norma / Conmutacion de norma / Norm omschakeling
SECAM	SECAM
U NTSC U NTSC	NTSC-Status / Status NTSC / Etat NTSC / Condizione NTSC / Status NTSC /
U AUTO SEC	Status f. autom. SECAM-Umschaltung / Status f. auto SECAM switchover / Statut pour commutation automatique SECAM / Stato per commutaz. autom. SECAM / "Status" para commutación SECAM automática / Status v.autom.SECAM-omschakeling
U SEC-O	Status SECAM Ost / Status SECAM east / Statut SECAM EST / Stato SECAM EST / "Status" SECAM oriental / Status SECAM oost
U SEC-W	Status SECAM West / Status SECAM west / Statut SECAM Quest / Stato SECAM OVEST / "Status" SECAM occidental / Status SECAM west
U SW SO	SECAM-OST/WEST-Abfragespannung / SECAM EAST/WEST scanning voltage / Tension d'identification Secam FR/Secam ME / Tensione di richiesta SECAM-EST/OVEST / Tensión de encuesta SECAM ESTE/OESTE / SECAM oost/west scan-spanning
U CP U CP	Canal Plus
U SCR	Schaltspannung "Scrambler" / "Scrambler" switching voltage / Tension de commutation "décodeur" / Tensione di commutazione "Scrambler" / Tensión de conmutación "Scrambler" / „Descrambler" schakelspanning
AFC	Von der Empfangsfrequenzeinstellung abhängige Spannung / Voltage dependent on the selected frequency / Tension de CAF / Tensione dipendente dalla regolaz. frequ. di ricezione / Tensión dependiente del ajuste de la frecuencia de recepción / Automatische frequentie controler
U ATS	Automatic Tuning Search Pegel / Automatic Tuning Search Level / Niveau de recherche automatique (ACP) / Livello ricerca automatica sint. / Nivel ATTS / Auto tuning search niveau
SAT-ID	SAT (Satellit)-Mute-Kennung / SAT (Satellite) Mute identification / Identification mute SAT / Identificazione silenziamento SAT / Código de silenciación SAT (satélite) / SAT (Satelliet) Mute identificatie
SAT-MUT	SAT Mute / SAT mute / Silence SAT / Silenziamento SAT / Mute SAT / SAT mute
SAT-DEV	SAT Hub / SAT deviation / Excursion SAT / Deviazione SAT / Excursión de SAT / SAT zwaai
$F_H/2$	Halbe Zeilenfrequenz / Half line frequency / Fréquence demie-ligne/ Frequenza di riga dimezzata / Semifrequencia de línea / Halve lijnfrequentie
FLY ER	Rotierender Löschkopf / Flying erase head / Tête d'effacement rotative / Testina cancellazione rotante / Cabeza rotativa de borrado / Roterende wiskop
U PIC U PI.CO	Picture Control / Contrôle de contour image / Controllo definizione dell' immagine / Control de imagen / Picture control
U CR	Stellerspannung Crispening / Threshold Voltage Crispening / Tension de réglage contours / Tensione Crispening / Tensión rep. "crispening" / Offsetspanning crispening
U SVHS -EP	FM-Hüllkurve Bild S-VHS / FM Envelope Video S-VHS / Envelope FM image S-VHS / Inviluppo video FM S-VHS / Envolvente de FM de imagen (S-VHS) / FM-Pakket S-VHS
U VHS -EP	FM-Hüllkurve Bild VHS / FM Envelope Video VHS / Envelope FM image VHS / Inviluppo video FM VHS / Envolvente de FM de imagen (VHS) / FM-Pakket VHS
U S-VHS VHS	VHS/S-VHS Umschaltung / VHS/S-VHS Switching / Commutation VHS/S-VHS / Commutatione VHS/S-VHS / Conmutación VHS/S-VHS / VHS/S-VHS omschakeling
U SQ/PB	S-VHS Wiedergabe / S-VHS Playback / Lecture S-VHS / Riproduzione S-VHS / Reproduccion S-VHS / S-VHS weergave
U SVHS DET	S-VHS Erkennung / S-VHS detection voltage / Identification S-VHS / Identificazione S-VHS / Deteccion S-VHS / S-VHS herkenning
SCK	Serielle Clockleitung / Serial clock line / Ligne horlage serielle / Linea clock seriale / Linea serie de reloj / Seriële clock leiding
SO	Serielle Datenausgabe / Serial data output / Sortie serielle de donnes / Uscita dati seriali / Salida serie de datos / Seriële data output
SI	Serielle Dateneingabe / Serial data input / Entree serielle de donnes / Ingresso dati seriali / Entrada serie de datos / Seriële data input
DTL	Datenübernahmeleitung / Data transfer line / Ligne echange de donnes / Linea di transferimento dati / Linea transferencia datos / Data transfer leiding
OE	Ausgangsfreigabe / Output enable / Validation sortie / Consenso di uscita/ Habilitación salida / Output enable
BLANK	Signalaustastung / Signal Blanking / Suppression du signal / Sopressione segnale / Supresión de señal / Signaal Blanking
U EN-FB	Freigabe des Fastblank Impuls / Fast blank pulse enable / Validation impulsion blanking / Consenso dell` impulso del bianco / Enable impulso Fastblanking / Vrijgave voor fastblanking impuls
RESET	Reset-Impuls / Reset pulse / Impulsion de reset / Impulso reset / Impulso de reset / Reset puls
STROBE STB	Datenübernahmeimpuls / Data Transfer Pulse / Impulsion de transfert de données / Impulso trasferimento dati / Impulso de transferencia de datos / Data transfer puls
DATA	Datenleitung / Data line / Ligne de donnes / Linea dati/ Linea datos / Data leiding
CLOCK CLK	Clockleitung / Clock line / Ligne horloge / Linea clock / Linea reloj / Clock leiding
SDA	I^{2}C-Bus-Datenleitung / I^{2}C Bus data line / Ligne de donnes Bus I^{2}C / Linea dati I^{2}C-Bus / Linea datos del Bus I^{2}C/ I^{2}C Bus data leiding
SCL	I^{2}C-Bus-Clockleitung / I^{2}C Bus clock line / Ligne horloge Bus I^{2}C Linea clock I^{2}C-Bus / Linea reloj del Bus I^{2}C / I^{2}C-Bus klok leiding
CONTROL-S	Daten für Fernsteuerung über CONTROL-S-Buchse / Remote Control Data via the CONTROL-S-socket / Données pour télécommande via la prise CONTROL-S / Dati per telecomando tramite presa CONTROL-S / Datos para el manejo a distancia a través del conector CONTROL-S / Afstandsbedienings data via de CONTROL-S ingang

Schaltplansymbole für Audiosignale-Statusbefehle
Circuit diagram symbols for Audio signals / Status commands
Symboles sur schema pour commandes de statut Audio
Simboli di comando Audio
Simbolos de las senales de Audio y status de mando
Schema symbolen voor Audio signalen en Status commandos

AUDIO	Audiosignal, Mono / Audio signal, Mono / Signal Audio, Mono / Segnale Audio, Mono / Senal de Audio, Mono / Audiosignaal, Mono
AUDIO-L	Audiosignal, links / Audio signal, left / Signal Audio, gauche / Segnale Audio, sinistro / Senal de Audio, izquierda / Audiosignaal, links
AUDIO-R	Audiosignal, rechts / Audio signal, right / Signal Audio, droit / Segnale Audio, destro / Senal de Audio, derecha / Audiosignaal, rechts
FM-S	FM-Ton / FM sound / Son FM / Audio FM / Sonido FM / FM-Geluid
U↓ FR I U↑ FR I	Frankreich Band I / France band I / France bande I / Francia banda I / Banda I Francesa / Frankrijk band 1
HIFI-R	HIFI-Ton rechts / HIFI sound right / Son HIFI droit / Audio HIFI destro/ Sonido HIFI derecha / HIFI-Geluid rechts
HIFI-L	HIFI-Ton links / HIFI sound left / Son HIFI gauche / Audio HIFI sinistro/ Sonido HIFI izquierda / HIFI-Geluid links
U↓ WR-A U↑ WR-A	Ton-WR-Status / Sound WR status / Statut WR Audio (enregistrement/lecture) / Stato Audio WR / Status Grabacion/reproduccion sonido / Geluid WR status
HI-S	Kopfumschaltimpuls-Ton / Sound head switching pulse / Impulsion de commutation tete/son / Impulso di commutazione testina Audio/ Conmutacion cabezas de sonido / Geluid head switching puls
HI-OUT	Kopfumschaltimpuls Ton- Ausgang / Head switching pulse audio out/ Impulsion de commutation de tête sortie audio / Impulso commutaz. testine - uscita audio / Salida impulse conmutación cabeza sonido / Head switching puls audio out
U↓ CH 2 U↓ CH 1	Status Tonkanal 1, 2/ Sound channel 1, 2 status / Statut canal 1, 2 Stato canale Audio 1, 2 / Status canal 1, 2 sonido dual / Geluid kanaal 1,2 status
CH1/CH2 STEREO	Kanal 1, Kanal 2, Stereo / Channel 1,channel 2, Stereo / Canal 1, canal 2, Stereo / Canale 1, canale 2, Stereo / Kanaal 1, Kanaal 2, Stereo
U↑ MICRO	Schaltspannung für Mikrofon / Micro Switching Voltage / Tension de commutation pour micro / Tensione di commutazione microfono / Tensión de conmutación para micrófono -/ Schakelspanning voor microfoon
	Mikrofon-Eingang / Microphone input / Entree micro / Ingresso microfono / Entrada microfono / Microfoon ingang
U ↗ FMSID	FM-Ton-Kennung / FM sound identification / Identification Audio FM/ Identificazione Audio FM / Identificacion sonido FM / FM geluid identificatie
U↑ FMSRE	Status f. Aufn. FM-Ton / FM sound record status / Statut pour enregistrement son FM / Stato di registrazione Audio FM / Status grabacion sonido FM / FM geluid opname status
SE	Tonlöscher / Sound erase/ Effacement son / Cancellazione Audio /Borrado sonido / Geluid wiskop
FTE	Hauptlöscher / Full-track erase / Tete d´effacement pleine piste / cancellazione completa / Borrado total / Fulltrack wiskop
U↓ AUTOM. U↑ AUTOM.	Automatik/Manuell-Umschaltung / Automatic/manuel switch-over Commutation automatique/manuel / Commutazione automatica/ manuale / Conmutacion automatico/manual / Automatic/Manuel omschakeling
U↓ FM-A	FM-Ton-Status / FM sound status / Statut Audio FM / Stato Audio FM / Status sonido FM / FM-Geluid status
U↓ 2CHS	Zwei-Ton-Status / 2-channel sound status / Statut double son / Stato doppio Audio / Status sonido dual / 2-Kanaal geluid status
U↓ MUTE U↑ MUTE	Stummschaltung / Muting / Circuit de silence / Silenziamento / Silenciador / Muting
U↓ MUTE EUAV	Stummschaltung Ton EURO-AV / Muting sound EURO-AV / Circuit silence son EURO-AV / Silenziamento audio EURO-AV / Silenciador sonido EURO-AV / Muting geluid EURO-AV
U↓ MD	Microvertonung / Microphone dubbing / Sonorisation micro / Doppiaggio con microfono / Sonorizacion micro / Microfoon dubbing
U↓ DUB U↑ DUB	Nachvertonung/ Dubbing / Postsonorisation / Postsonorizzazione / Sonorizacion posterior / Dubbing
U↑ TRICK	Status Trick/Function truqage/Situaz. effetto speciale/Status truco / Status Trick
Control	Ansteuerung Eingangswahlschalter / Control input select switch / Commande de sélecteur entrand / Selettore ingresso pilotagio / Exitación del selector de entradas / Stuuringang keuze schakelaar.
U ↗ τ	Verzögerte Regelspannung / Delayed control voltage / Tension de regulation retardee / Tensione di regolazione ritardata / Tension diferida de cag / Vertraagde stuurspanning
REC	Audio-Aufnahme-Signal z. A/W-Kopf / Audio record signal to R/P head / Tete Audio/mode d´enregistrement / Registrazione Audio segnale alla testina R/A / Grabacion (cabeza de Audio) / Audio opnamesignaal naar opname-/weergavekop
PB	Audio-Wiedergabe-Signal v. A/W-Kopf / Audio playback signal from R/P head / Tete Audio/mode lecture / Riproduzione Audio segnale dalla testina R/A / Reproduccion (cabeza de Audio) / Audio weergave signaal naar opname-/weergavekop
	Nullpunkt-Einstellung der Audio-Anzeige / Zero adjustment of audio indicator / Point zéro affichage audio / Regolazione zero dell'indicazione Audio / Punto cero indicador de audio / Nulpunt instelling voor audio indicator
	Aufnahme-Empfindlichkeit, rechter Kanal / Record sensitivity, right channel / Niveau d'enregistrement, canal droit / Sensibilita de registrazione, canale destra / Nivel grabacion, canal derecho / Opname niveau, rechter kanaal
	Aufnahme-Empfindlichkeit, linker Kanal / Record sensitivity, left channel / Niveau d'enregistrement, canal gauche / Sensibilita de registrazione, canale sinistro / Nivel grabacion, canal izquierdo / Opname niveau linker kanaal
	Meßwertanzeige, analog rechts / Meter reading, analog right / Indicateur de modulation analogique, droit / Indicazione valore di misura analogico, destra / Indicador de nivel, derecho / Meterwaarde analoog rechts
	Meßwertanzeige, analog links / Meter reading, analog left / Indicateur de modulation analogique, gauche / Indicazione valore di misura analogico, sinistro / Indicador de nivel izquierdo / Meterwaarde analoog links
U ↗ FMES	FM Hüllkurve Ton / FM envelope, sound / Courbe envelopante audio FM / Curva d'inviluppo FM audio / FM-curva envolvente de sonido / FM-Pakket HIFI
U↓ +5V W U↑ +5V W	Wiedergabe-Status / Playback status / Status reproduction / Stato riproduzione / Status reproduccion / Weergave status
WR	WR-Status / WR status / Statuts WR / Stato WR / Status WR / WR status
NORM.	Normalton / Normal Sound / Son normal / Audio normale / Sonido normal / Normaal geluid
NICAM	Nicam
REC ↑ PB U↑ PB REC	Aufnahme/Wiedergabe-Umschaltung / Record/playback switching /Commutation enregistrement/lecture / Commutaz. registrazione/ riproduzione / Conmutación grab/repro / Opname/Weergave omschakeling
U↑ REC U↓ REC	Aufnahme-Umschaltung / Record switch-over / Commutation enregistrement / Commutazone-registrazione / Conmutación de grabación / Opname omschakeling
U↓ FTE U↑ FTE	Status Hauptlöscher / Status Mains Erase System / Etat effacem. principal / Stato cancellatore totale / "Status" de borrado total / Status Fulltrackwiskop
U↓ SE	Status Tonlöscher / Status Sound Erase / Etat effacem. audio / Stato cancellatore audio / "Status" de borrado de sonido / Status geluidwiskop
U↓ PB/T-M	Wiedergabe Trick-Mix / Switching Voltage Playback Trick-Mix / Tension de commutation lecture Trick mix / Tens. commut. riprod.Trick-Mix / Tensón conm. repro/trick-mix / Weergave Trick Mix
MIX	Schaltspannung Mix-Betrieb / Switching Voltage Mix-Mode / Tension de commutation fonction mix / Tens. commut. funzionam. Mix / Tensión conm. modo MIX / Schakelspanning Mix gebruik
U ↗ LM	Stellerspannung "Master"-Pegel / Threshold Voltage "Master"-Level / Tension de réglage du niveau "master" / Tensione livello "Master" / Tensión para nivel MASTER / Offset-spanning masterlevel
U ↗ LO	Stellerspannung Ausgangspegel / Threshold Voltage Output Level / Tension de réglage niveau de sortie / Tensione livello s'uscita /Offset-spanning uitgangslevel
WT 1	Tacho Wickelteller links / Tacho generator, left spindle / Générateur tachymétrique du plateau porte-bobine gauche / Piattello avvolg.tachim.sinistro / Tacometro del portacarrete izquierdo / Tacho generator, links
WT 2	Tacho Wickelteller rechts / Tacho generator, right spindle / Générateur tachymétrique du plateau porte-bobine droit / Piattello avvolg. tachim.destro / Tacometro del portacarrete derecho / Tacho generator, rechts
FAD	Ton-Ein-/Ausblendung / Sound fade-in/fade-out / Arrivée et disparition progressive du son / Audio inserito/escluso / Inserción/desinserción de sonido / Geluid fade-in/fade-out
U / HF-GEN	Generator-Steuerspannung / Generator control voltage / Tension de commande générateur / Tensione controllo generatore / Tensión de control del generator / Generator stuurspanning
SAT-SID	SAT (Satellit)-Tonkennung / SAT (Satellite) sound identification / Identification son SAT / Identificazione audio SAT / Código de sonido SAT (satélite) / SAT (Satelliet) Geluid identificatie
AUDIO CP	Canal Plus-Signal für Audio / "Canal plus" signal for audio / signal Canal Plus pour audio / Segnale canal-plus per audio / Señal de Canal Plus para audio / „Canal plus“ signaal voor audio
AGC	Automatische Verstärkungsregelung / AGC (Automatic Gain Control) / Contrôle automatique du gain / Regolazione automatica di amplificazione / Regulación automática de la amplificación / Gain control
U↑ FRESH	Pegelautomatik - Abschaltung und Rücksetzung / Automatic Level Control - switch-off and reset / Contrôle automatique de niveau - Arrêt et reset / Livello automatico-disinserimento e reinserimento / Nivel automatica - desconexion Y Reset / Automatische level controle-uitschakeling en RESET
U↑ PAR	Parallelvertonung / Parallel dubbing / Synchronisation simultanée / Sonorizzazione parallela / Dubbing / Parallel weegave

Schalterbezeichnungen / Switch designations / Désignation des contacts / Denominazioni degli interruttori / Denominacion de contactos / Schakelaar benamingen

CL 1/CL 2	Cassettenladekontakte / Cassette loading contacts / Contacts de positionnement logement cassette / Contatti caricamento cassetta Contactos del portacassette / Cassette loading contact
CS	Zählschalter / Counter switch / Contact de comptage / Interruttore di conteggio / Contacto contador / Teller schakelaar
CPS	Cassettenschachtkontakt / Cassette compartment switch / Contact logement cassette / Contatto vano cassetta / Posicion del portacassetta / Cassettecompartiment schakelaar
REC	Aufnahmesperre / Record lock / Sécurité d'enregistrement / Blocco di registrazione / Bloqueo de grabacion / Opname vergrendeling
PIS	Identifikationsschalter / Identification switch / Commutateur d'identification / Interruttore di identificazione / Contacto identificacion / Identificatieschakelaar
INIT	INIT.-Schalter / Deck switch / Commutation deck / Commutazione deck / Conmutador deck / Deck schakelaar

Kopfbezeichnungen / Head designations / Désignation des têtes / Denominazione delle testine / Abreviaturas de las cabezas / Kop benamingen

AWK	Aufnahme-/Wiedergabekopf / Record/playback head / Tête combinée enregistrement/lecture / Testina di registrazione/riproduzione / Opname-/Weergavekop
CTL	Synchronkopf / Sync head / Tête synchro / Testina di sincronismo / Cabeza de sincronismo / Synschroonkop
TLK	Tonlöschkopf / Sound erase head / Tête d'éffacement son / Testina di cancellazione audio / Cabeza de borrado de sonido / Geluid wiskop
HLK	Hauptlöschkopf/ Full-track erase head / Tête d'éffacement pleine piste / Testina de cancellazione completa / Cabeza de borrado total / Full-track wiskop

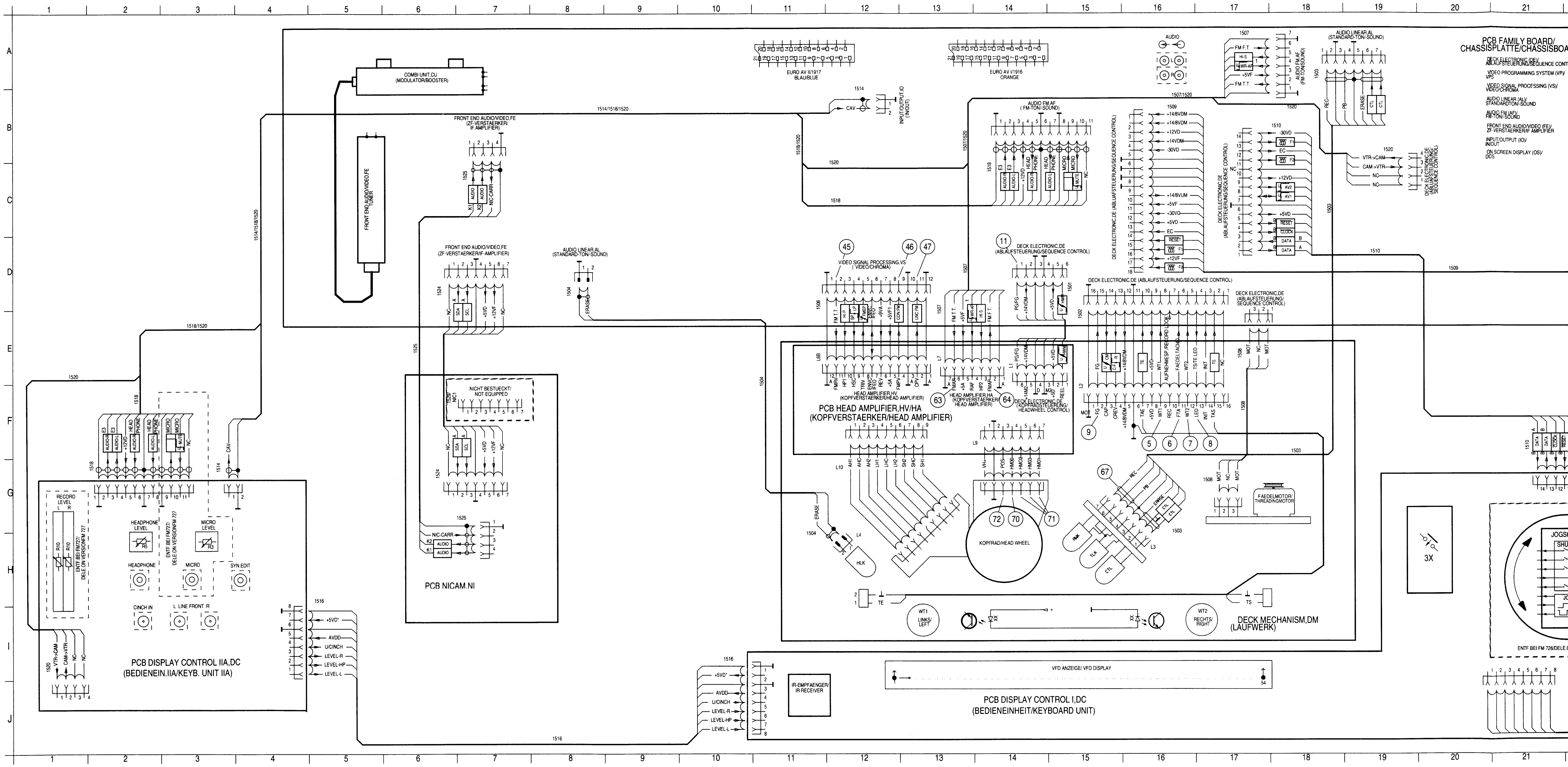
Sensoren-Abkürzungen / Sensor abbreviations / Abréviations de détecteurs / Abbreviazioni usate per i sensori / Abreviaturas empleadas para sensores / Sensoren afkortingen

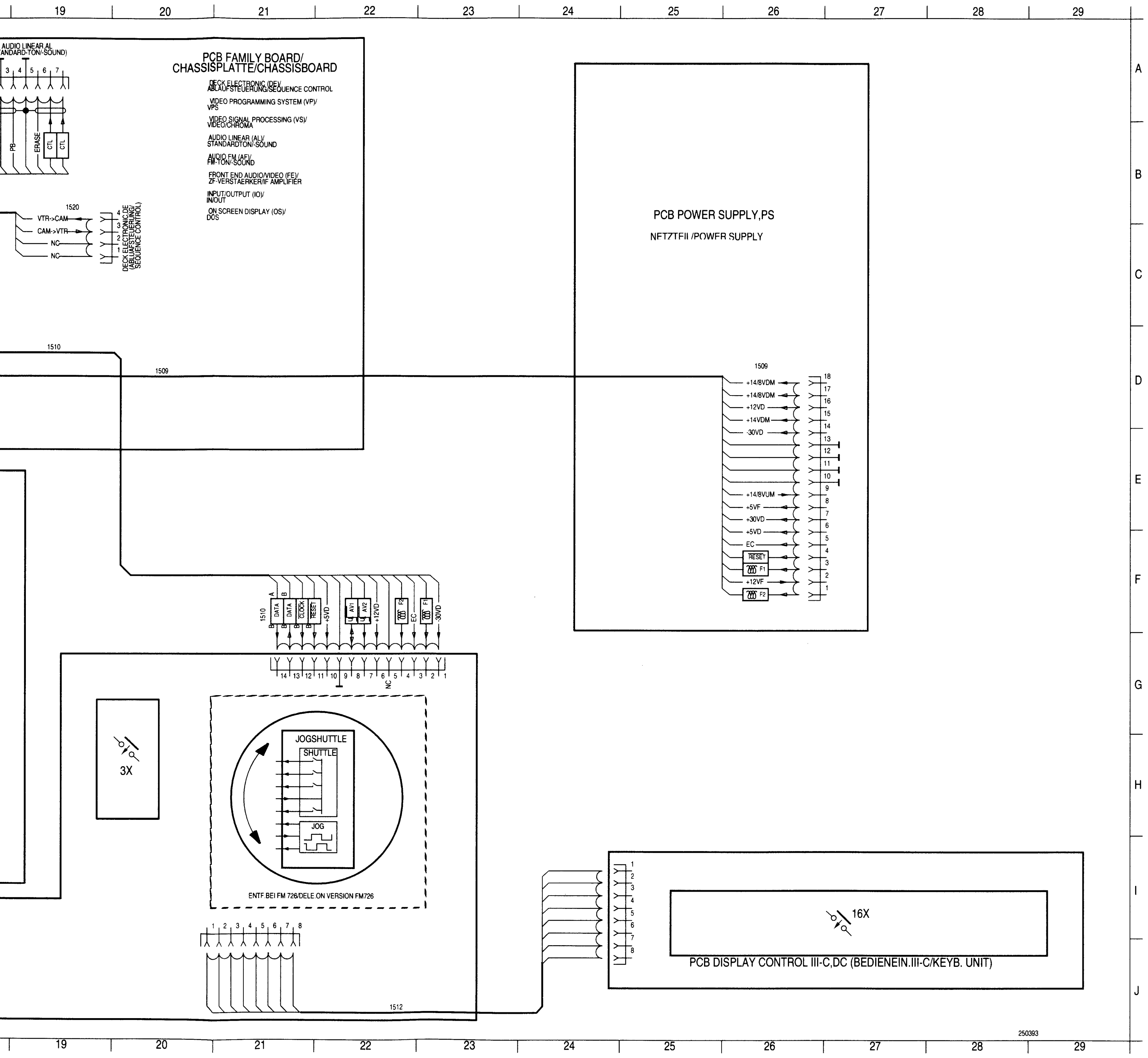
WPL / WM 1	Tacho Wickelteller links / Tacho generator, left spindle / Générateur tachymétrique du plateau porte-bobine gauche / Piattello avvolg.tachim.sinistro / Tacometro del portacarrete izquierdo / Tacho generator, linkse spoelschotel
WPR / WM 2	Tacho Wickelteller rechts / Tacho generator, right spindle / Générateur tachymétrique du plateau porte-bobine droit / Piattello avvolg.tachim.destro / Tacometro del portacarrete derecho / Tacho generator, rechtse spoelschotel
TAS	Bandanfang / Start of tape / Debut de bande / Inizio nastro / Principio de cinta / Begin band
TAE	Bandende / End of tape / Fin de bande / Fine nastro / Final de cinta / Einde band
FTA	Fädeltacho / Threading tacho / Tacho enfilage / Impulsi di caricamento / Taco de enhebrado / Inrijgtacho

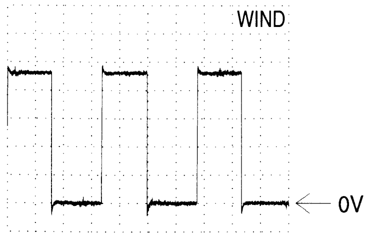
Spannungen-Abkürzungen / Voltage abbreviations / Abréviation des tensions / Abbreviaz. delle tensioni / Abreviaturas de las tensiones / Spanningen afkortingen

...V_D	Dauerspannung / Unswitched voltage / Tension permanente / Tensione permanente / Tension permanente / Continu spanning
...V_{DM}	Dauer-Motor-Spannung / Unswitched motor voltage / Tension permanente moteur / Tensione permanente motore / Tension permanente motor / Continu motor spanning
...$+V_A$	Aufnahmespannung / Record voltage / Tension d'enregistrement / Tensione di registrazione / Tension en grabacion / Opname spanning
...$+V_W$	Wiedergabespannung / Playback voltage / Tension lecture / Tensione di riproduzione / Tension en reproduccion / Weergave spanning
...V_F	Funktionspannung / Function voltage / Tension de fonctionnement/ Tensione de regime / Tension funciones / Funktie spanning
...V_{AHF}	HF-Aufnahmespannung / RF record voltage / Tension d´enregistrement HF / Tensione di registrazione HF / HStatus de grabacion RF / F-Opname spanning
...$V_{D\,UHR}$	Dauer-Uhr-Spannung / Unswitched clock voltage / Tension permanente horloge / Tensione permanente orologio / Tension permanente reloj / Continu klok spanning
...V_E	EIN-Spannung /Ein-/Ausschalter gedrückt) / " Machine-on" voltage (ON/OFF switch pressed) / Tension de marche (touche M/A enclenchée) / Tensione d'accensione (interr. accens./spegn. premuto) / Tension "En Marcha" (interruptor pulsado) / Inschakel Spanning (Aan/ Uit druk schake laar)
...V_B	Buchsenspannung / Socket voltage / Tension embase / Tensione presa / Tension en conector / Socket-spanning

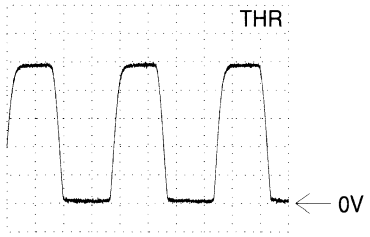
Wiring Diagram


COMBI UNIT.CU (MODULATOR/BOOSTER)
FRONT END AUDIO/VIDEO.FE TUNER
FRONT END AUDIO/VIDEO.FE (ZF-VERSTAERKER/ IF AMPLIFIER)
AUDIO LINEAR.AL (STANDARD-TON/-SOUND)
EURO AV II/1917 BLAU/BLUE
EURO AV I/1916 ORANGE
INPUT/OUTPUT.IO (IN/OUT)
AUDIO FM.AF (FM-TON/-SOUND)
VIDEO SIGNAL PROCESSING.VS (VIDEO/CHROMA)
DECK ELECTRONIC.DE (ABLAUFSTEUERUNG/SEQUENCE CONTROL)
PCB FAMILY BOARD/ CHASSISPLATTE/CHASSISBOA
DECK ELECTRONIC (DE)/ ABLAUFSTEUERUNG/SEQUENCE CONT
VIDEO PROGRAMMING SYSTEM (VP)/ VPS
VIDEO SIGNAL PROCESSING (VS)/ VIDEO/CHROMA
AUDIO LINEAR (AL)/ STANDARDTON/-SOUND
AUDIO FM (AF)/ FM-TON/-SOUND
FRONT END AUDIO/VIDEO (FE)/ ZF-VERSTAERKER/IF AMPLIFIER
INPUT/OUTPUT (IO)/ IN/OUT
ON SCREEN DISPLAY (OS)/ DCS
PCB HEAD AMPLIFIER,HV/HA (KOPFVERSTAERKER/HEAD AMPLIFIER)
HEAD AMPLIFIER.HV/ (KOPFVERSTAERKER/HEAD AMPLIFIER)
HEAD AMPLIFIER.HA (KOPFVERSTAERKER/ HEAD AMPLIFIER)
DECK ELECTRONIC.DE (KOPFRADSTEUERUNG/ HEADWHEEL CONTROL)
KOPFRAD/HEAD WHEEL
FAEDELMOTOR/ THREADINGMOTOR
DECK MECHANISM,DM (LAUFWERK)
WT1 LINKS/ LEFT
WT2 RECHTS/ RIGHT
NICHT BESTUECKT/ NOT EQUIPPED
PCB NICAM.NI
RECORD LEVEL L R
HEADPHONE LEVEL
MICRO LEVEL
ENTF BEI FM727/ DELE ON VERSIONFM 727
HEADPHONE
MICRO
SYN.EDIT
CINCH IN
L LINE FRONT R
PCB DISPLAY CONTROL IIA,DC (BEDIENEIN.IIA/KEYB. UNIT IIA)
IR-EMPFAENGER/ IR RECEIVER
VFD ANZEIGE/ VFD DISPLAY
PCB DISPLAY CONTROL I,DC (BEDIENEINHEIT/KEYBOARD UNIT)
3X
ENTF BEI FM 726/DELE
1514/1518/1520
1518/1520
1520
1518
1516
1503
1504
1509
1510
1525
1524
1507/1520
45
46
47
11
63
64
67
72
70
71
9
5
6
7
8
HLK
ERASE
VTR->CAM
CAM->VTR
+5VD*
AVDD
U/CINCH
LEVEL-R
LEVEL-HP
LEVEL-L
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
A B C D E F G H I J

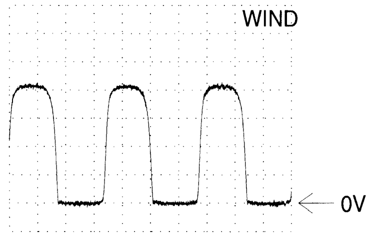

PCB FAMILY BOARD/
CHASSISPLATTE/CHASSISBOARD
DECK ELECTRONIC (DE)/ ABLAUFSTEUERUNG/SEQUENCE CONTROL
VIDEO PROGRAMMING SYSTEM (VP)/ VPS
VIDEO SIGNAL PROCESSING (VS)/ VIDEO/CHROMA
AUDIO LINEAR (AL)/ STANDARDTON/-SOUND
AUDIO FM (AF)/ FM-TON/-SOUND
FRONT END AUDIO/VIDEO (FE)/ ZF-VERSTAERKER/IF AMPLIFIER
INPUT/OUTPUT (IO)/ IN/OUT
ON SCREEN DISPLAY (OS)/ OCS
PCB POWER SUPPLY,PS
NETZTEIL/POWER SUPPLY
1509
1510
1512
1520
VTR->CAM
CAM->VTR
NC
ERASE
CTL
+14/8VDM
+12VD
+14VDM
-30VD
+14/8VUM
+5VF
+30VD
+5VD
EC
RESET
F1
+12VF
F2
3X
JOGSHUTTLE
SHUTTLE
JOG
ENTF BEI FM 726/DELE ON VERSION FM726
16X
PCB DISPLAY CONTROL III-C,DC (BEDIENEIN.III-C/KEYB. UNIT)
250393
19
20
21
22
23
24
25
26
27
28
29
A
B
C
D
E
F
G
H
I
J



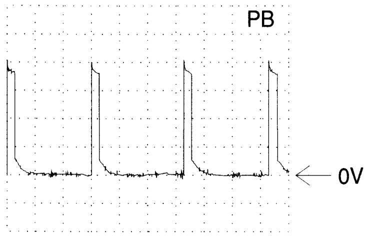
A: DC, 1V/Div, 2ms/Div
IC 7050 Pin 7/8
⑤



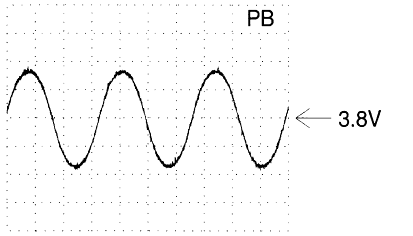
A: DC, 1 V/Div, 5ms/Div
Connector 1502, 6 FTA (Threading)
⑥



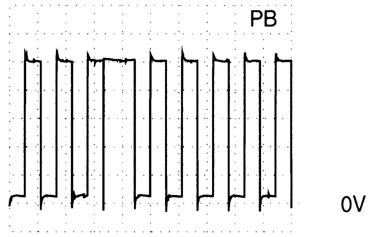
A: DC, 1 V/Div, 2ms/Div
Connector 1502, 5/8 WT2/WT1
⑦



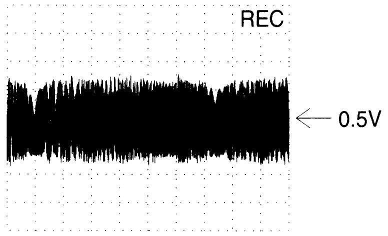
A: DC, 1 V/Div, 5ms/Div
Connector 1502, 4 LED
⑧



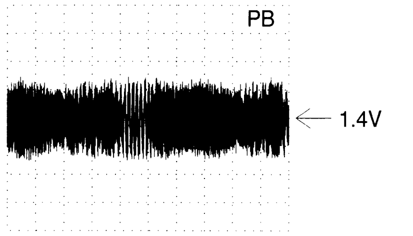
A: AC, 500mV/Div, 200us/Div
Connector 1502, 15, FG
⑨



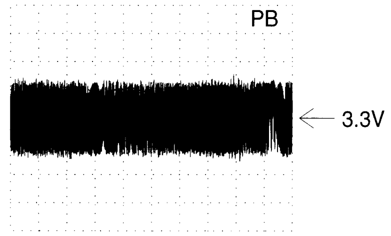
A: DC, 1 V/Div, 2ms/Div
Connector 1501, 1 PG/FG
11



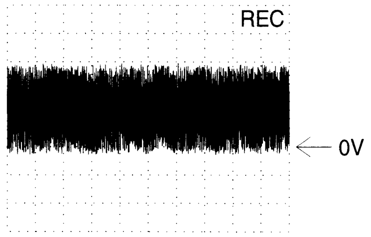
A: AC, 100mV/Div, 10us/Div
Connector 1526,2 FMZB
㊺



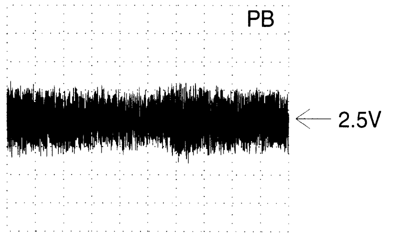
A: AC, 100mV/Div, 10us/Div
Connector 1526,9 Y-FM
㊻



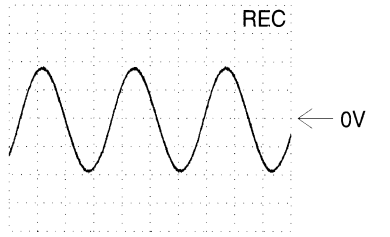
A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 35
㊼



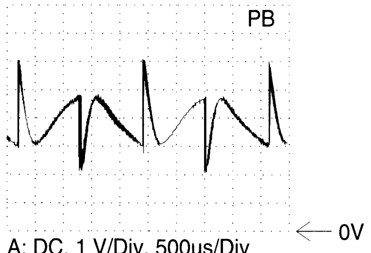
A: DC, 200mV/Div, 10us/Div
Connector 1507 Pin 2
(63)



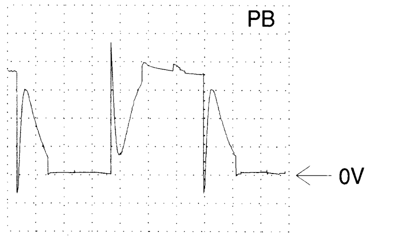
A: AC, 200mV/Div, 10us/Div
Connector 1507 Pin 6
(64)



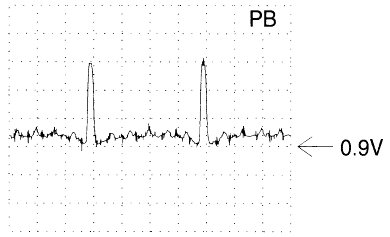
A: AC, 20 V/Div, 5us/Div
Connector 1503 Pin 1
(67)



A: DC, 1 V/Div, 500us/Div
Connector L9,4
(70)

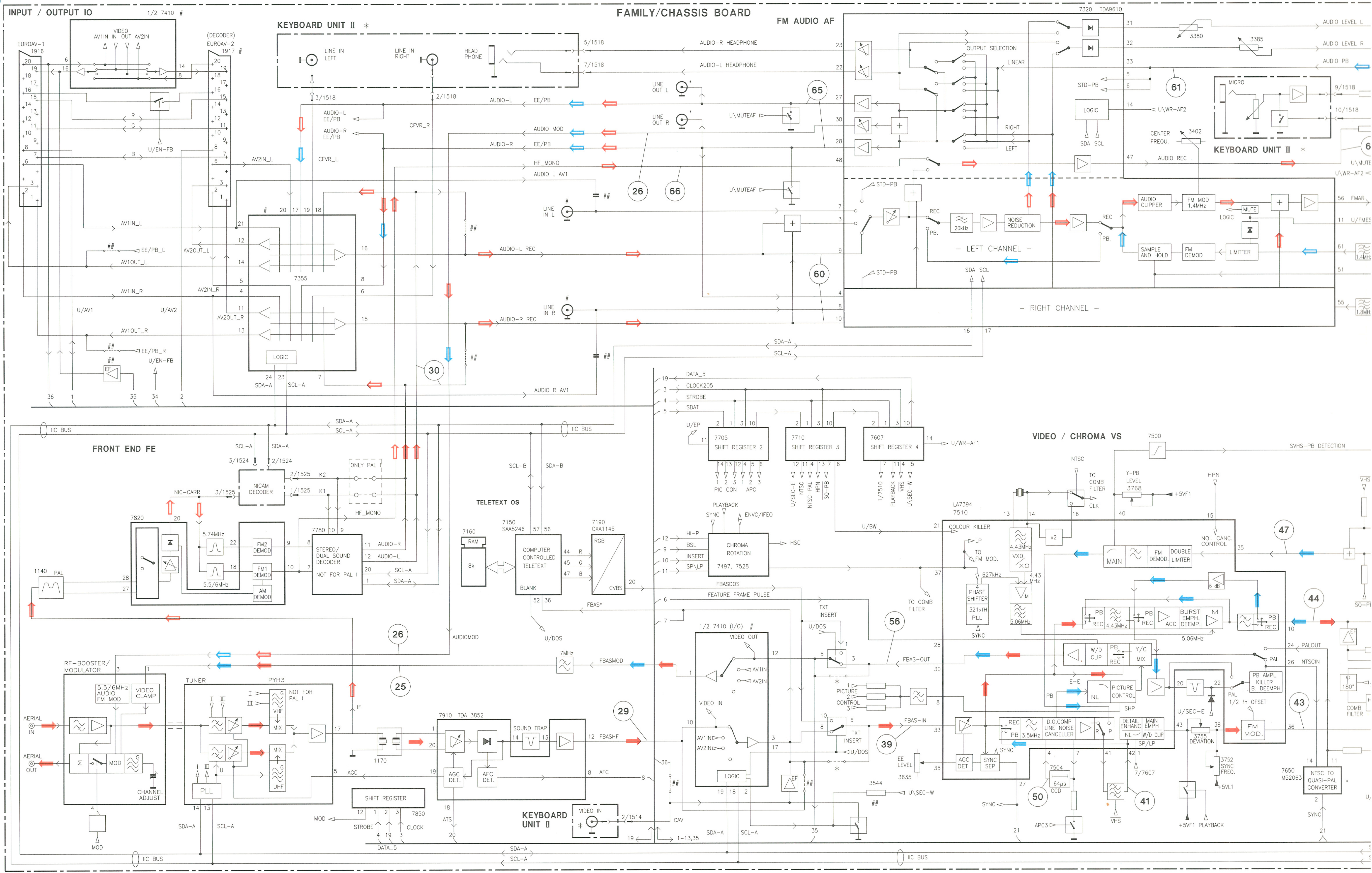


A: DC, 2 V/Div, 1ms/Div
Connector L9, 5/6/7
(71)

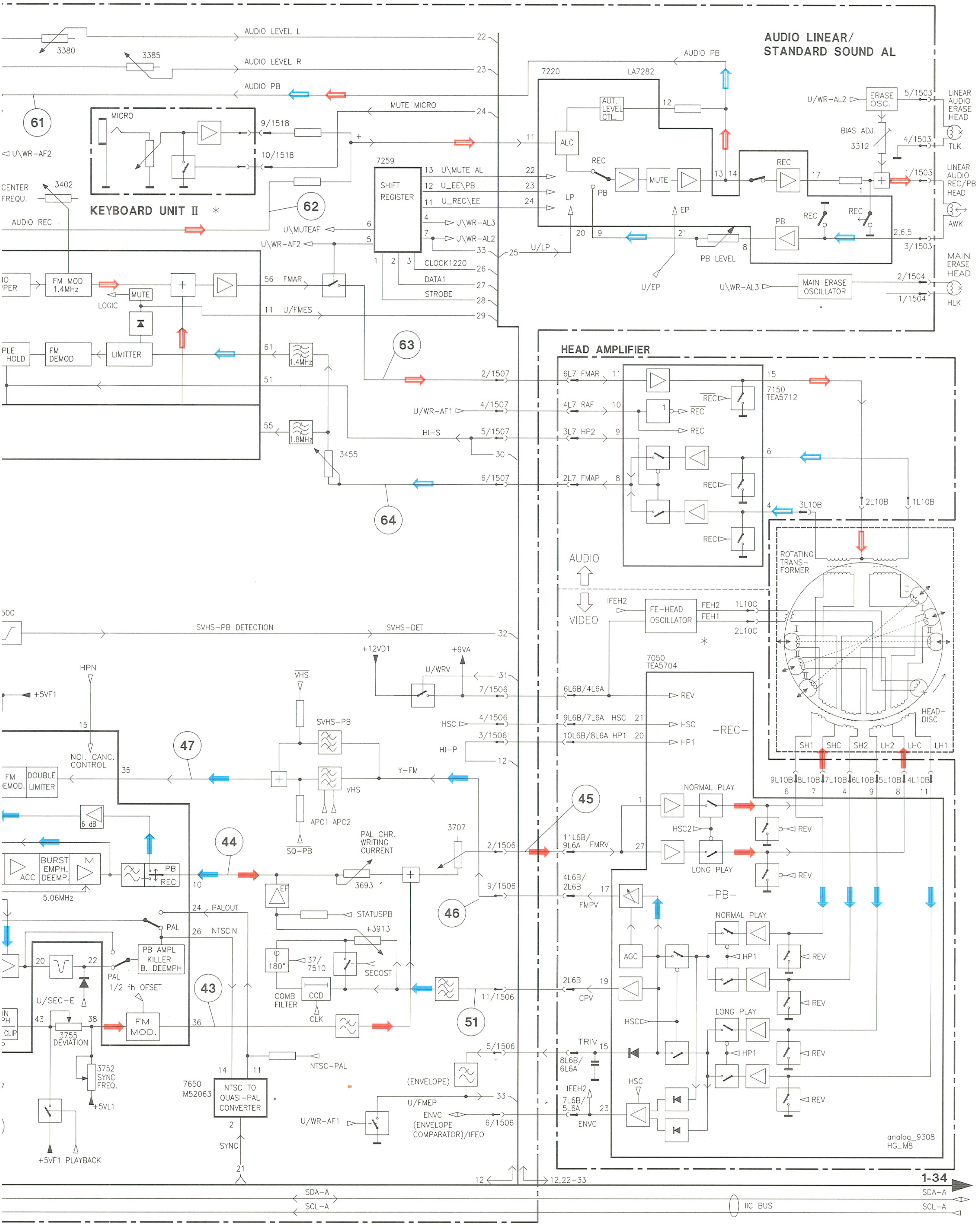


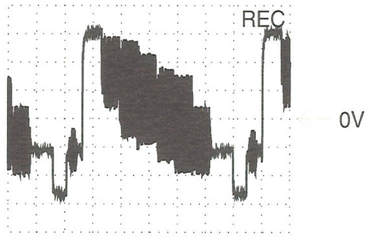
A: AC, 200mV/Div, 10ms/Div
Connector L9, 3
(72)

Block Diagram Analog


INPUT / OUTPUT IO
1/2 7410 #
EUROAV-1
1916
VIDEO
AV1IN IN OUT AV2IN
(DECODER)
EUROAV-2
1917 #
U/EN-FB
AV2IN_L
AV1IN_L
EE/PB_L
AV1OUT_L
AV2OUT_L
AV1IN_R
AV2IN_R
U/AV1
U/AV2
AV2OUT_R
AV1OUT_R
EE/PB_R
7355
LOGIC
SDA-A
SCL-A
KEYBOARD UNIT II *
LINE IN LEFT
LINE IN RIGHT
HEAD PHONE
3/1518
2/1518
AUDIO-L EE/PB
AUDIO-R EE/PB
CFVR_R
CFVR_L
AUDIO-L
AUDIO MOD
AUDIO-R
HF_MONO
AUDIO L AV1
AUDIO-L REC
AUDIO-R REC
AUDIO R AV1
LINE OUT L
LINE OUT R
LINE IN L
LINE IN R
U\MUTEAF
FAMILY/CHASSIS BOARD
FM AUDIO AF
5/1518
7/1518
AUDIO-R HEADPHONE
AUDIO-L HEADPHONE
7320 TDA9610
OUTPUT SELECTION
LINEAR
STD-PB
LOGIC
SDA SCL
RIGHT
LEFT
REC
PB.
20kHz
NOISE REDUCTION
LEFT CHANNEL
RIGHT CHANNEL
AUDIO CLIPPER
FM MOD 1.4MHz
MUTE
SAMPLE AND HOLD
FM DEMOD
LIMITTER
3380
3385
AUDIO LEVEL L
AUDIO LEVEL R
AUDIO PB
MICRO
9/1518
10/1518
U\WR-AF2
CENTER FREQU.
3402
AUDIO REC
KEYBOARD UNIT II *
FMAR
U/FMES
1.4MHz
1.8MHz
65
61
26
66
60
30
DATA_5
CLOCK205
STROBE
SDAT
U/EP
7705 SHIFT REGISTER 2
7710 SHIFT REGISTER 3
7607 SHIFT REGISTER 4
U/WR-AF1
PIC CON APC
U/SEC-E
NTSC
NTSC-PAL
HPN
SQ-PB
1/7510
PLAYBACK
VHS
U\SEC-W
IIC BUS
FRONT END FE
SCL-A
SDA-A
3/1524
2/1524
2/1525
1/1525
3/1525
NIC-CARR
NICAM DECODER
ONLY PAL
K2
K1
HF_MONO
7820
5.74MHz
5.5/6MHz
FM2 DEMOD
FM1 DEMOD
AM DEMOD
7780
STEREO/ DUAL SOUND DECODER
NOT FOR PAL I
AUDIO-R
AUDIO-L
SCL-A
SDA-A
1140 PAL
TELETEXT OS
SCL-B
SDA-B
7160
RAM
8k
7150
SAA5246
COMPUTER CONTROLLED TELETEXT
BLANK
7190
CXA1145
RGB
CVBS
FBAS*
U/DOS
AUDIOMOD
26
25
7MHz
FBASMOD
RF-BOOSTER/ MODULATOR
5.5/6MHz AUDIO FM MOD
VIDEO CLAMP
AERIAL IN
AERIAL OUT
MOD
CHANNEL ADJUST
TUNER
PYH3
NOT FOR PAL I
VHF
MIX
UHF
PLL
IF
AGC
1170
7910 TDA 3852
SOUND TRAP
AGC DET.
AFC DET.
FBASHF
AFC
29
SHIFT REGISTER
7850
STROBE
CLOCK
DATA_5
ATS
KEYBOARD UNIT II
VIDEO IN
2/1514
CAV
1-13,35
HI-P
BSL
INSERT
SP\LP
PLAYBACK SYNC
ENVC/IFEO
CHROMA ROTATION
7497, 7528
HSC
FBASDOS
FEATURE FRAME PULSE
TXT INSERT
1/2 7410 (I/O) #
VIDEO OUT
AV1IN
AV2IN
VIDEO IN
LOGIC
PICTURE CONTROL
TXT INSERT
U/DOS
FBAS-IN
FBAS-OUT
39
56
EE LEVEL
3635
3544
U\SEC-W
VIDEO / CHROMA VS
7500
SVHS-PB DETECTION
NTSC
TO COMB FILTER
CLK
Y-PB LEVEL 3768
+5VF1
HPN
LA7394
7510
U/BW
COLOUR KILLER
TO FM MOD.
4.43MHz
VXO
627kHz
PHASE SHIFTER
321xfH PLL
SYNC
5.06MHz
x2
NOI. CANC. CONTROL
MAIN
FM DEMOD.
DOUBLE LIMITER
6 dB
47
44
PB REC
4.43MHz
ACC
BURST EMPH. DEEMP.
TO COMB FILTER
W/D CLIP
Y/C MIX
E-E
NL
PICTURE CONTROL
SHP
PAL
PALOUT
NTSCIN
PB AMPL KILLER B. DEEMPH
1/2 fh OFSET
FM MOD.
43
U/SEC-E
3755 DEVIATION
3752 SYNC FREQ.
+5VL1
+5VF1 PLAYBACK
D.O.COMP LINE NOISE CANCELLER
DETAIL ENHANC
MAIN EMPH
W/D CLIP
SP/LP
7504 64μs CCD
APC3
50
41
VHS
AGC DET
SYNC SEP
7/7607
7650 M52063
NTSC TO QUASI-PAL CONVERTER
SYNC
180°
COMB FILTER
SQ-PB
VHS

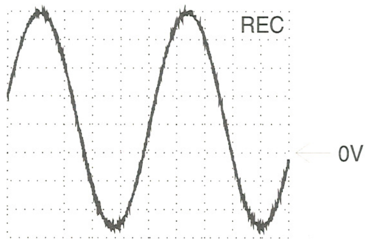
➡ RECORD VIDEO ⇨ RECORD AUDIO ➡ PLAYBACK VIDEO ⇨ PLAYBACK AUDIO *OPTION # ONLY FOR SETS WITH 2 SCART PLUGS ## NOT FOR SETS WITH 2 SCART PLUGS


AUDIO LINEAR/
STANDARD SOUND AL
AUDIO LEVEL L
AUDIO LEVEL R
AUDIO PB
3380
3385
61
62
63
64
MICRO
KEYBOARD UNIT II *
MUTE MICRO
9/1518
10/1518
U\WR-AF2
CENTER FREQU.
3402
AUDIO REC
7259
SHIFT REGISTER
13 U\MUTE AL
12 U_EE\PB
11 U_REC\EE
U\WR-AL3
U\WR-AL2
U\MUTEAF
U\WR-AF2
CLOCK1220
DATA1
STROBE
7220
LA7282
AUT. LEVEL CTL.
ALC
MUTE
REC
PB
LP
EP
U/LP
U/EP
PB LEVEL
U\WR-AL2
ERASE OSC.
BIAS ADJ. 3312
5/1503
4/1503
1/1503
2,6,5
3/1503
2/1504
1/1504
LINEAR AUDIO ERASE HEAD
TLK
LINEAR AUDIO REC/PB HEAD
AWK
MAIN ERASE HEAD
HLK
MAIN ERASE OSCILLATOR
U\WR-AL3
FM MOD 1.4MHz
MUTE
LOGIC
FM DEMOD
LIMITTER
FMAR
U/FMES
1.4MHz
1.8MHz
3455
HEAD AMPLIFIER
2/1507
4/1507
5/1507
6/1507
U/WR-AF1
HI-S
6L7 FMAR
4L7 RAF
3L7 HP2
2L7 FMAP
7150
TEA5712
3L10B
2L10B
1L10B
ROTATING TRANS-FORMER
AUDIO
VIDEO
IFEH2
FE-HEAD OSCILLATOR
FEH2
FEH1
1L10C
2L10C
HEAD-DISC
SH1 SHC SH2 LH2 LHC LH1
SVHS-PB DETECTION
SVHS-DET
+12VD1
+9VA
U/WRV
7/1506
6L6B/4L6A
7050
TEA5704
REV
HSC
HP1
-REC-
4/1506
3/1506
9L6B/7L6A HSC
10L6B/8L6A HP1
HI-P
HPN
+5VF1
NOI. CANC. CONTROL
FM DEMOD.
DOUBLE LIMITER
47
44
43
45
46
51
SVHS-PB
Y-FM
VHS
APC1 APC2
SQ-PB
PAL CHR. WRITING CURRENT
3707
3693
2/1506
11L6B/9L6A FMRV
NORMAL PLAY
LONG PLAY
HSC2
-PB-
BURST EMPH. DEEMP.
ACC
PB
REC
5.06MHz
6 dB
PALOUT
NTSCIN
PAL
STATUSPB
+3913
37/7510
180°
COMB FILTER
CCD
CLK
SECOST
PB AMPL KILLER B. DEEMPH
PAL 1/2 fh OFSET
U/SEC-E
FM MOD.
3755 DEVIATION
3752 SYNC FREQ.
+5VL1
9/1506
4L6B/2L6B FMPV
AGC
2L6B CPV
11/1506
HSC
5/1506
TRIV
8L6B/6L6A
IFEH2
7L6B/5L6A
ENVC
NTSC-PAL
7650
M52063
NTSC TO QUASI-PAL CONVERTER
SYNC
(ENVELOPE)
U/FMEP
ENVC (ENVELOPE COMPARATOR)/IFEO
6/1506
U/WR-AF1
+5VF1 PLAYBACK
analog_9308
HG_M8
1-34
12,22-33
SDA-A
SCL-A
IIC BUS



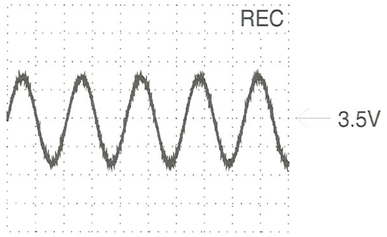
A: DC, 200mV/Div, 10us/Div
Modulator Pin 1

25



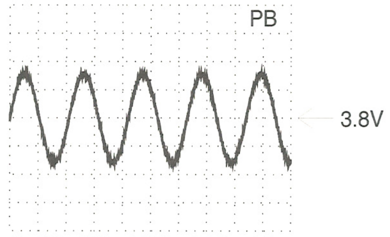
A: DC, 200mV/Div, 200us/Div
Modulator Pin 3

26



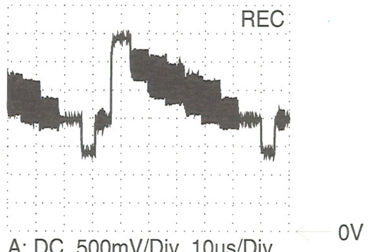
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 30

26



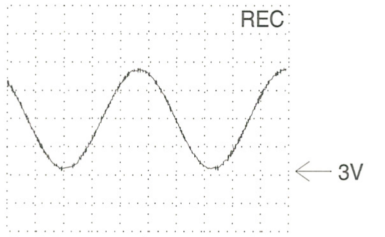
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 30

26



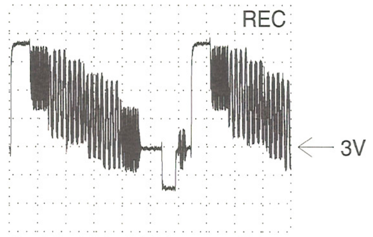
A: DC, 500mV/Div, 10us/Div
IC 7910 Pin 12

29



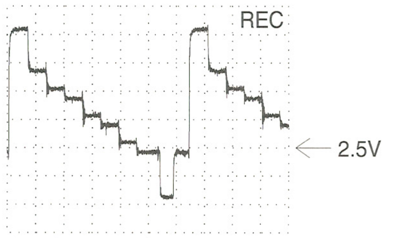
A: AC, 500mV/Div, 200us/Div
IC 7780 Pin 11/12

㉚



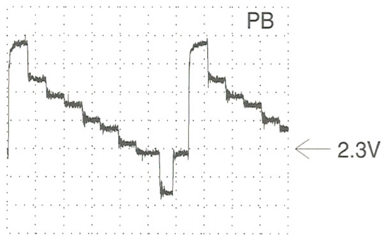
A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 33

㊴



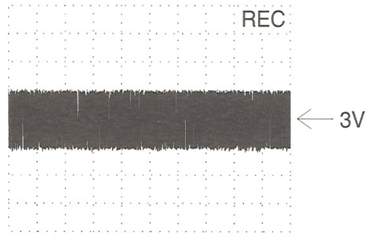
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 42

㊶



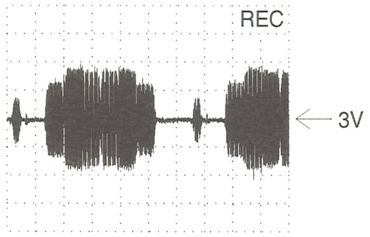
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 42

㊶



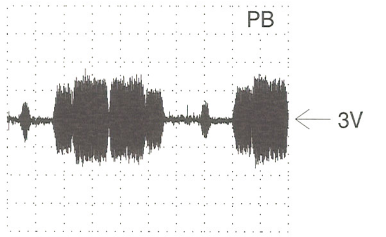
A: AC, 500mV/Div, 10us/Div
IC 7510 Pin 36

㊸



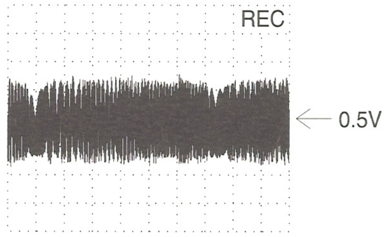
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 10

㊹



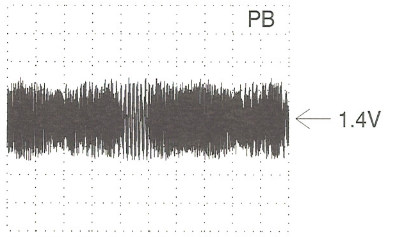
A: AC, 50mV/Div, 10us/Div
IC 7510 Pin 10

㊹



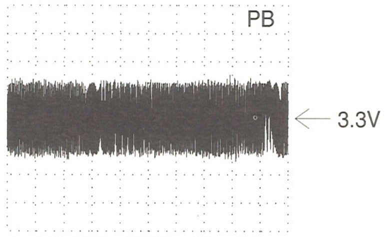
A: AC, 100mV/Div, 10us/Div
Connector 1526,2 FMZB

㊺



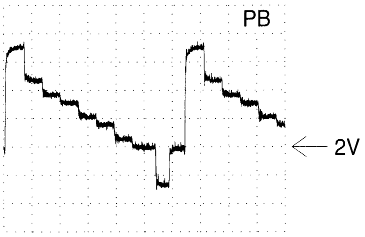
A: AC, 100mV/Div, 10us/Div
Connector 1526,9 Y-FM

㊻

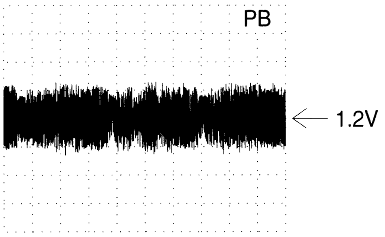


A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 35

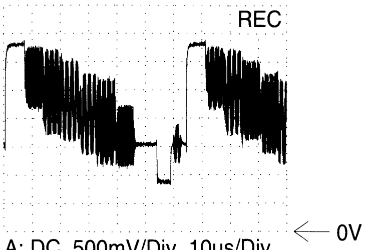
㊼



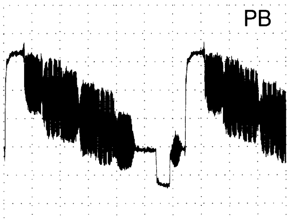
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 4
㊿



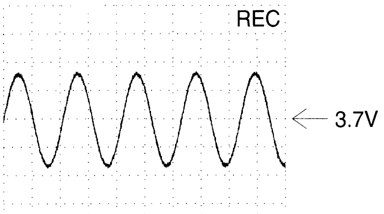
A: AC, 200mV/Div, 20us/Div
CONNECTOR 1526,11 FM-CH
(51)



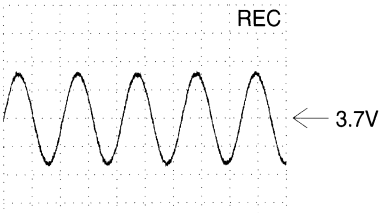
A: DC, 500mV/Div, 10us/Div
IC 7510 Pin 30
(56)



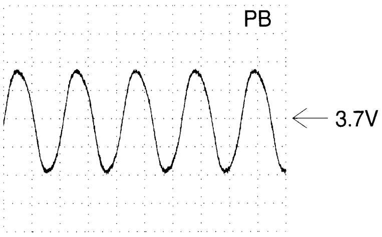
A: DC, 500mV/Div, 10us/Div
IC 7510 Pin 30
(56)



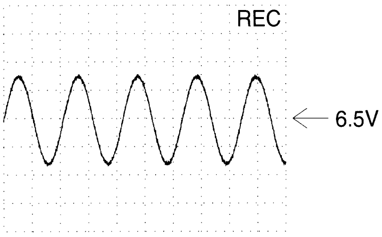
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 9
(60)



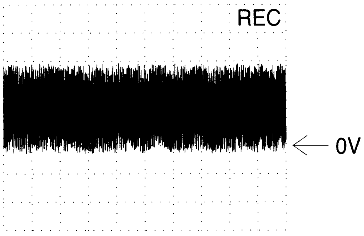
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 5
(61)



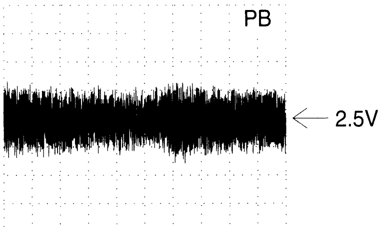
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 5
(61)



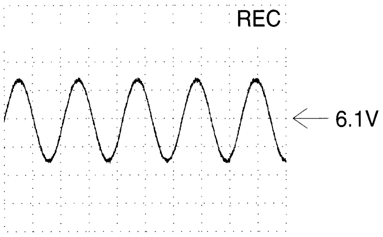
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 47
(62)



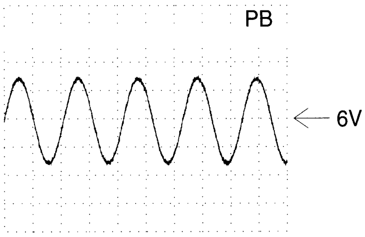
A: DC, 200mV/Div, 10us/Div
Connector 1507 Pin 2
(63)



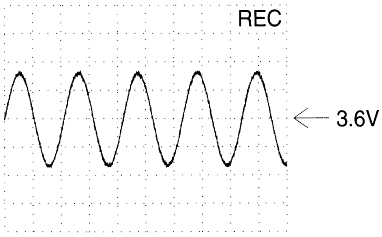
A: AC, 200mV/Div, 10us/Div
Connector 1507 Pin 6
(64)



A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 27
(65)

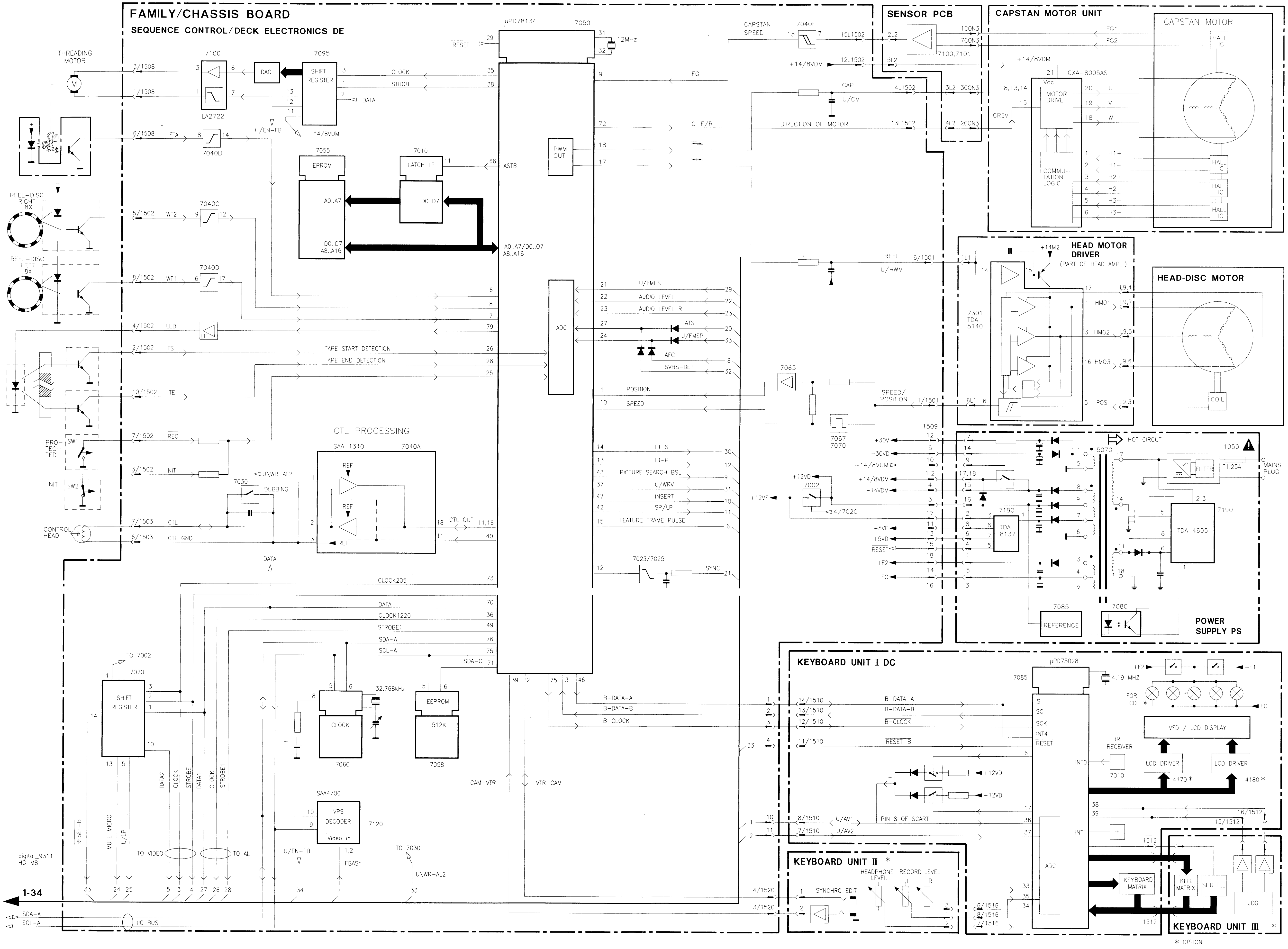


A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 27
(65)



A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 48
(66)

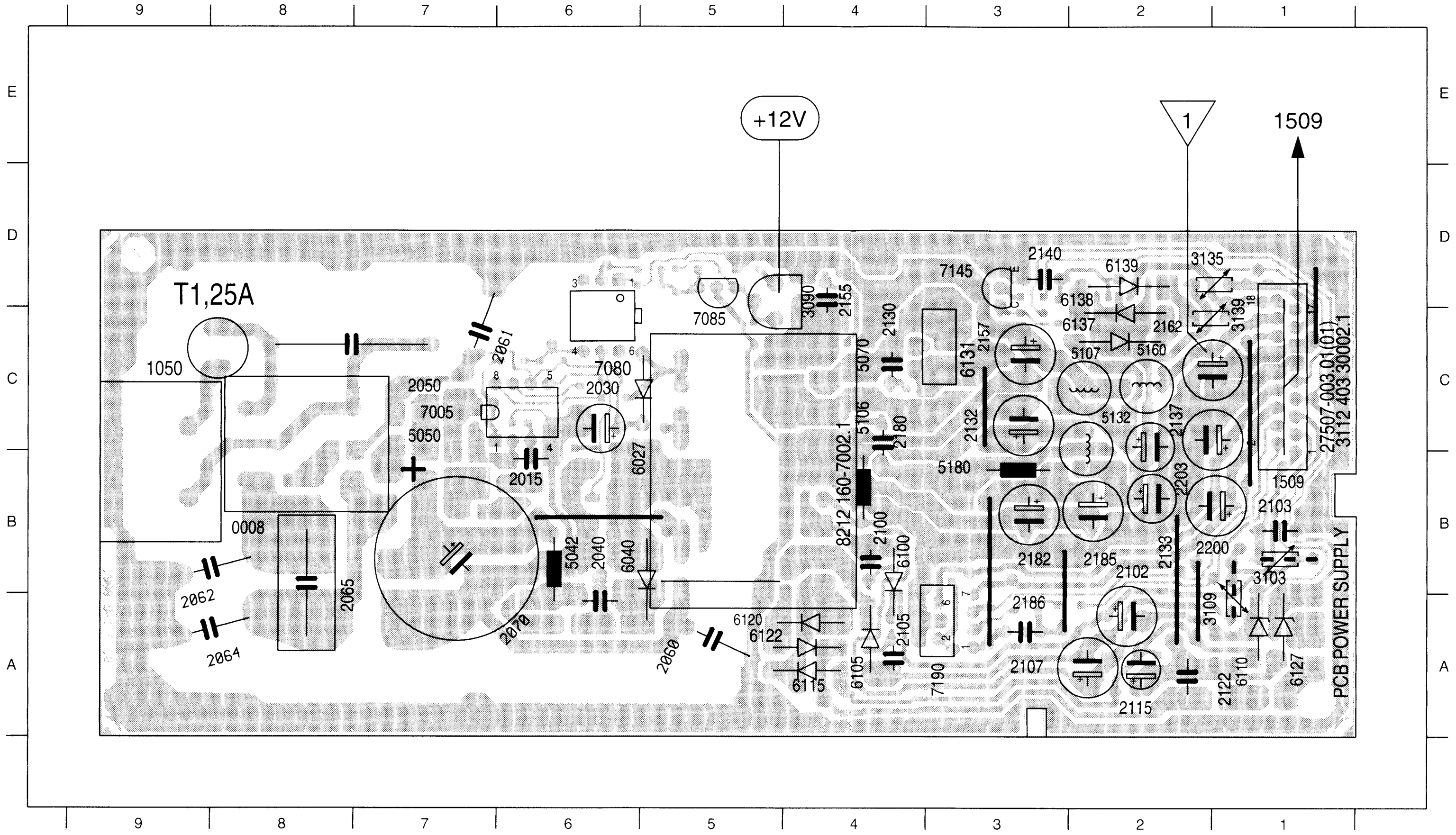
Block Diagram Digital


FAMILY/CHASSIS BOARD
SEQUENCE CONTROL/DECK ELECTRONICS DE
THREADING MOTOR
7100
LA2722
7095
SHIFT REGISTER
DAC
CLOCK
STROBE
DATA
U/EN-FB
+14/8VUM
FTA
7040B
7055
EPROM
7010
LATCH LE
A0..A7
D0..D7
D0..D7 A8..A16
A0..A7/D0..D7 A8..A16
ASTB
µPD78134
7050
RESET
12MHz
PWM OUT
ADC
REEL-DISC RIGHT 8X
REEL-DISC LEFT 8X
WT2
WT1
7040C
7040D
LED
TS
TE
TAPE START DETECTION
TAPE END DETECTION
PRO-TEC-TED
SW1
REC
INIT
SW2
CTL PROCESSING
SAA 1310
7040A
REF
7030
U\WR-AL2
DUBBING
CONTROL HEAD
CTL
CTL GND
CTL OUT
DATA
CLOCK205
CLOCK1220
STROBE1
SDA-A
SCL-A
SDA-C
TO 7002
7020
SHIFT REGISTER
32,768kHz
CLOCK
7060
EEPROM
512K
7058
SAA4700
VPS DECODER
Video in
7120
FBAS*
TO 7030
RESET-B
MUTE MICRO
U/LP
DATA2
CLOCK
STROBE
DATA1
CLOCK
STROBE1
TO VIDEO
TO AL
CAM-VTR
VTR-CAM
digital_9311 HG_M8
1-34
SDA-A
SCL-A
IIC BUS
CAPSTAN SPEED
7040E
FG
+14/8VDM
CAP
U/CM
C-F/R
DIRECTION OF MOTOR
U/FMES
AUDIO LEVEL L
AUDIO LEVEL R
ATS
U/FMEP
AFC
SVHS-DET
POSITION
SPEED
7065
7067
7070
SPEED/POSITION
REEL
U/HWM
HI-S
HI-P
PICTURE SEARCH BSL
U/WRV
INSERT
SP/LP
FEATURE FRAME PULSE
7023/7025
SYNC
B-DATA-A
B-DATA-B
B-CLOCK
SENSOR PCB
7100,7101
CAPSTAN MOTOR UNIT
CAPSTAN MOTOR
CXA-8005AS
MOTOR DRIVE
COMMU-TATION LOGIC
CREV
FG1
FG2
HALL IC
H1+
H1-
H2+
H2-
H3+
H3-
HEAD MOTOR DRIVER
(PART OF HEAD AMPL.)
+14M2
7301 TDA 5140
HMO1
HMO2
HMO3
POS
HEAD-DISC MOTOR
COIL
+30V
-30VD
+14/8VUM
+14/8VDM
+14VDM
+12VD
7002
+12VF
4/7020
+5VF
+5VD
RESET
+F2
EC
HOT CIRCUIT
5070
1050
T1,25A
MAINS PLUG
FILTER
7190
TDA 8137
TDA 4605
7085
REFERENCE
7080
POWER SUPPLY PS
KEYBOARD UNIT I DC
µPD75028
7085
4.19 MHZ
SI
SO
SCK
INT4
RESET
RESET-B
INT0
INT1
FOR LCD *
VFD / LCD DISPLAY
IR RECEIVER
7010
LCD DRIVER
4170 *
4180 *
+F2
-F1
+12VD
U/AV1
U/AV2
PIN 8 OF SCART
ADC
KEYBOARD UNIT II *
SYNCHRO EDIT
HEADPHONE LEVEL
RECORD LEVEL
KEYBOARD MATRIX
KEB. MATRIX
SHUTTLE
JOG
KEYBOARD UNIT III *
* OPTION

Power Supply (PS)

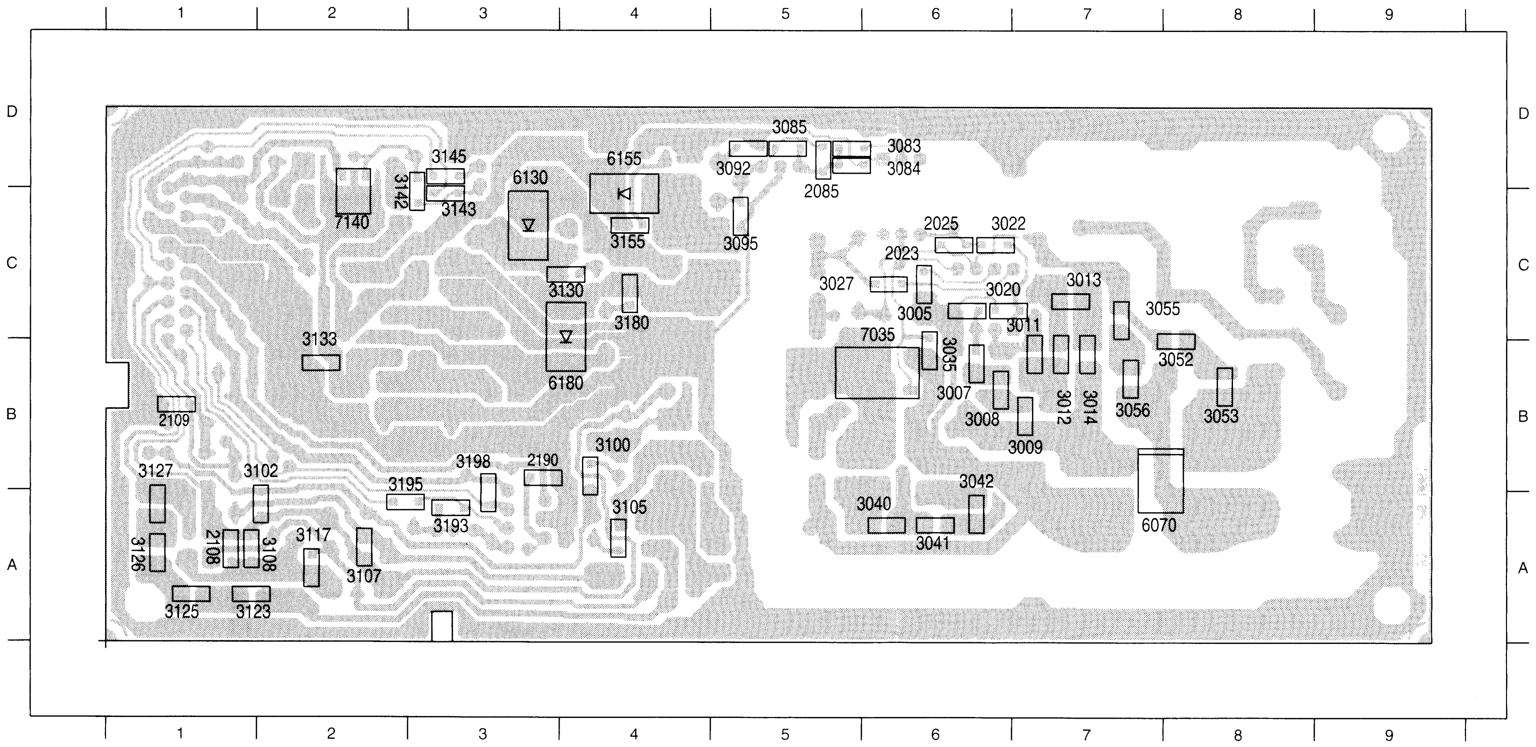
1509 —> Family Board

View of Components Side (Conventional Assembly)

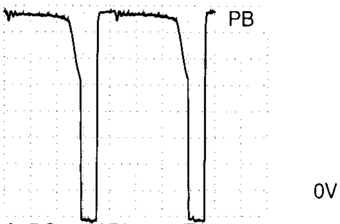

9
8
7
6
5
4
3
2
1
E
D
C
B
A
+12V
1
1509
T1,25A
1050
0008
2062
2064
2065
2050
7005
5050
2070
2061
7080
2030
2015
6027
5042
2040
6040
7085
3090
2155
2060
6120
6122
6115
6105
2105
2100
6100
8212 160-7002.1
5106
2180
5070
2130
2132
6131
2157
7145
2140
6139
6138
6137
2162
5107
5160
5132
2137
5180
2203
2182
2185
2102
2133
2186
7190
2107
2115
2200
3109
2122
6110
3135
3139
2103
3103
6127
27507 003 01001
3112 403 30002.1
PCB POWER SUPPLY

0008	B	9
1050	C	9
1509	C	1
2015	B	6
2030	C	6
2040	A	6
2050	C	8
2060	A	5
2061	C	7
2062	B	9
2064	A	9
2065	B	8
2070	B	7
2100	B	4
2102	A	2
2103	B	1
2105	A	4
2107	A	2
2115	A	2
2122	A	2
2130	C	4
2132	C	3
2133	B	2
2137	C	2
2140	D	3
2155	D	4
2157	C	3
2162	C	2
2180	C	4
2182	B	3
2185	B	2
2186	A	3
2200	B	2
2203	C	2
3090	D	5
3103	B	1
3109	B	1
3135	D	2
3139	C	2
5042	B	6
5050	C	8
5070	B	5
5106	B	4
5107	C	2
5132	C	2
5160	C	2
5180	B	3
6027	C	6
6040	B	6
6100	B	4
6105	A	4
6110	A	1
6115	A	4
6120	A	4
6122	A	4
6127	A	1
6131	C	3
6137	C	2
6138	D	2
6139	D	2
7005	C	6
7080	C	6
7085	D	5
7145	D	3
7190	A	3

View of Solder Side (Chip Assembly)

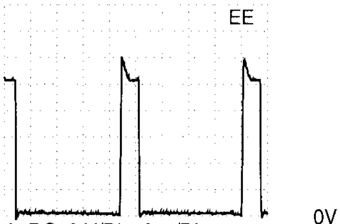

1
2
3
4
5
6
7
8
9
D
C
B
A
3145
3142
3143
7140
6130
6155
3155
3085
3092
3083
3084
2085
3095
2025
3022
2023
3027
3005
3020
3011
3013
3055
7035
3035
3052
3007
3008
3012
3014
3056
3053
3009
3130
3180
6180
3133
2109
3127
3102
3195
3198
2190
3100
3193
3105
3126
2108
3108
3117
3107
3125
3123
3040
3041
3042
6070

2023	C	6
2025	C	6
2085	D	5
2108	A	1
2109	B	1
2190	B	3
3005	C	6
3007	B	6
3008	B	6
3009	B	7
3011	B	7
3012	B	7
3013	C	7
3014	B	7
3020	C	7
3022	C	6
3027	C	6
3035	B	6
3040	A	6
3041	A	6
3042	A	6
3052	C	8
3053	B	8
3055	C	7
3056	B	7
3083	D	5
3084	D	5
3085	D	5
3092	D	5
3095	C	5
3100	B	4
3102	A	2
3105	A	4
3107	A	2
3108	A	1
3117	A	2
3123	A	1
3125	A	1
3126	A	1
3127	A	1
3130	C	4
3133	B	2
3142	D	3
3143	D	3
3145	D	3
3155	C	4
3180	C	4
3193	A	3
3195	A	3
3198	B	3
6070	B	8
6130	C	3
6155	D	4
6180	C	4
7035	B	6
7140	D	2



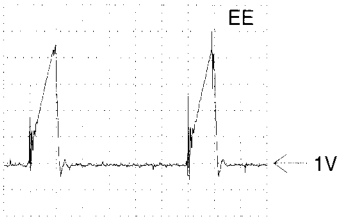
A: DC, 50V/Div, 2us/Div
7036 Drain

1



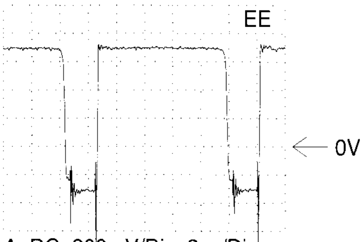
A: DC, 2 V/Div, 2us/Div
IC 7005 Pin 5

2



A: AC, 200mV/Div, 2us/Div
IC 7005 Pin 2

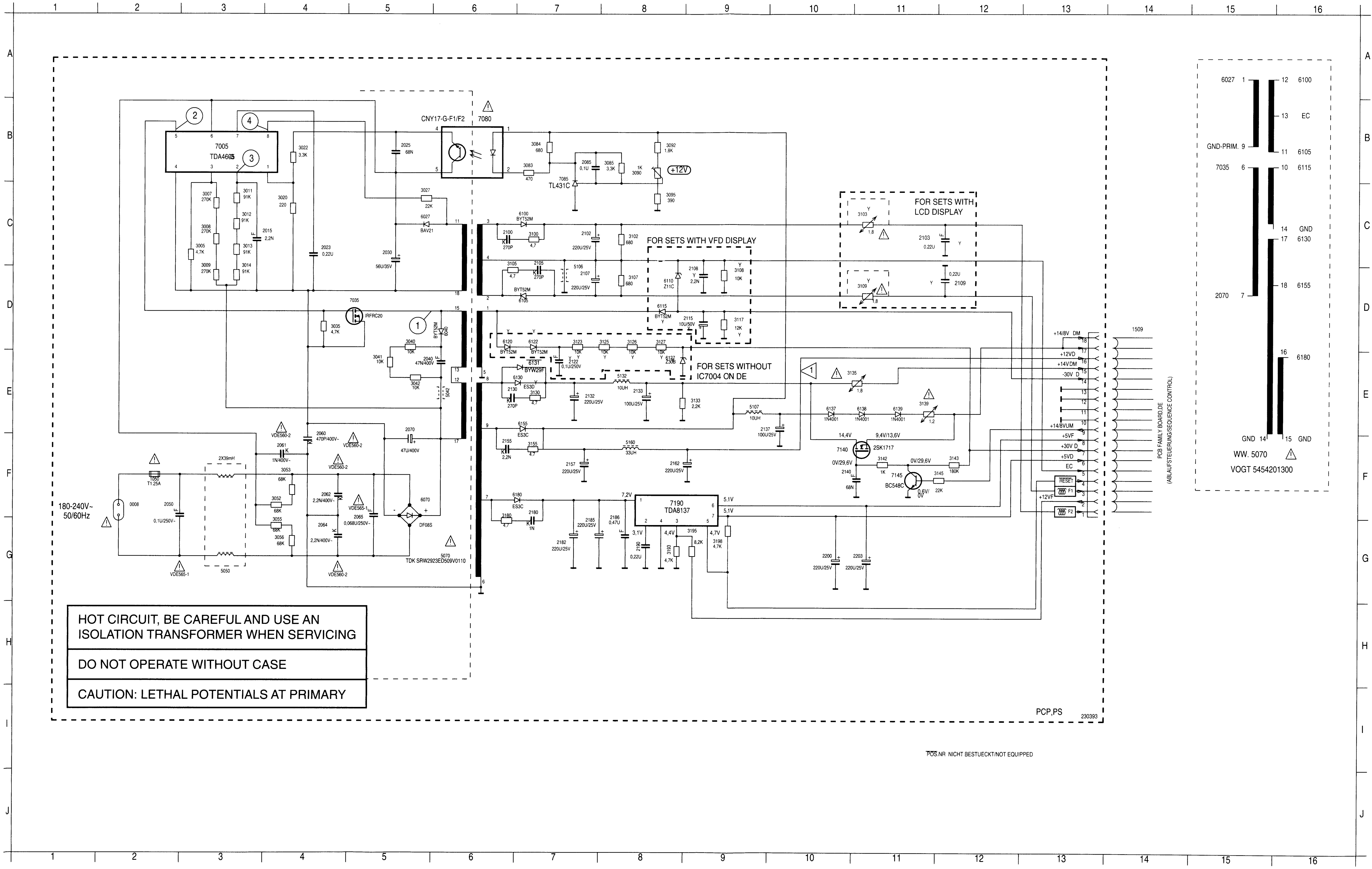
③



A: DC, 200mV/Div, 2us/Div
IC 7005 Pin 8

④

Power Supply (PS)


7005
TDA4605
7080
CNY17-G-F1/F2
7085
TL431C
+12V
7035
IRFRC20
7190
TDA8137
7140
2SK1717
7145
BC548C
6027
BAV21
6100
BYT52M
6105
BYT52M
6115
BYT52M
6110
Z11C
6120
BYT52M
6122
BYT52M
6131
BYW29F
6130
ES3D
6155
ES3C
6180
ES3C
6137
1N4001
6138
1N4001
6139
1N4001
6070
DF08S
1050
T1.25A
0008
2X39mH
5050
5070
TDK SRW2923ED509V0110
180-240V~
50/60Hz
VDE565-1
VDE560-2
VDE565-1
FOR SETS WITH LCD DISPLAY
FOR SETS WITH VFD DISPLAY
FOR SETS WITHOUT IC7004 ON DE
1509
+14/8V DM
+12VD
+14VDM
-30V D
+14/8VUM
+5VF
+30V D
+5VD
EC
RESET
F1
F2
+12VF
PCB FAMILY BOARD,DE
(ABLAUFSTEUERUNG/SEQUENCE CONTROL)
GND-PRIM.
GND
WW. 5070
VOGT 5454201300
6100
6105
6115
6130
6155
6180
14,4V
9,4V/13,6V
0V/29,6V
7,2V
5,1V
3,1V
4,4V
4,7V
PCP,PS
230393

HOT CIRCUIT, BE CAREFUL AND USE AN ISOLATION TRANSFORMER WHEN SERVICING

DO NOT OPERATE WITHOUT CASE

CAUTION: LETHAL POTENTIALS AT PRIMARY

POS.NR NICHT BESTUECKT/NOT EQUIPPED

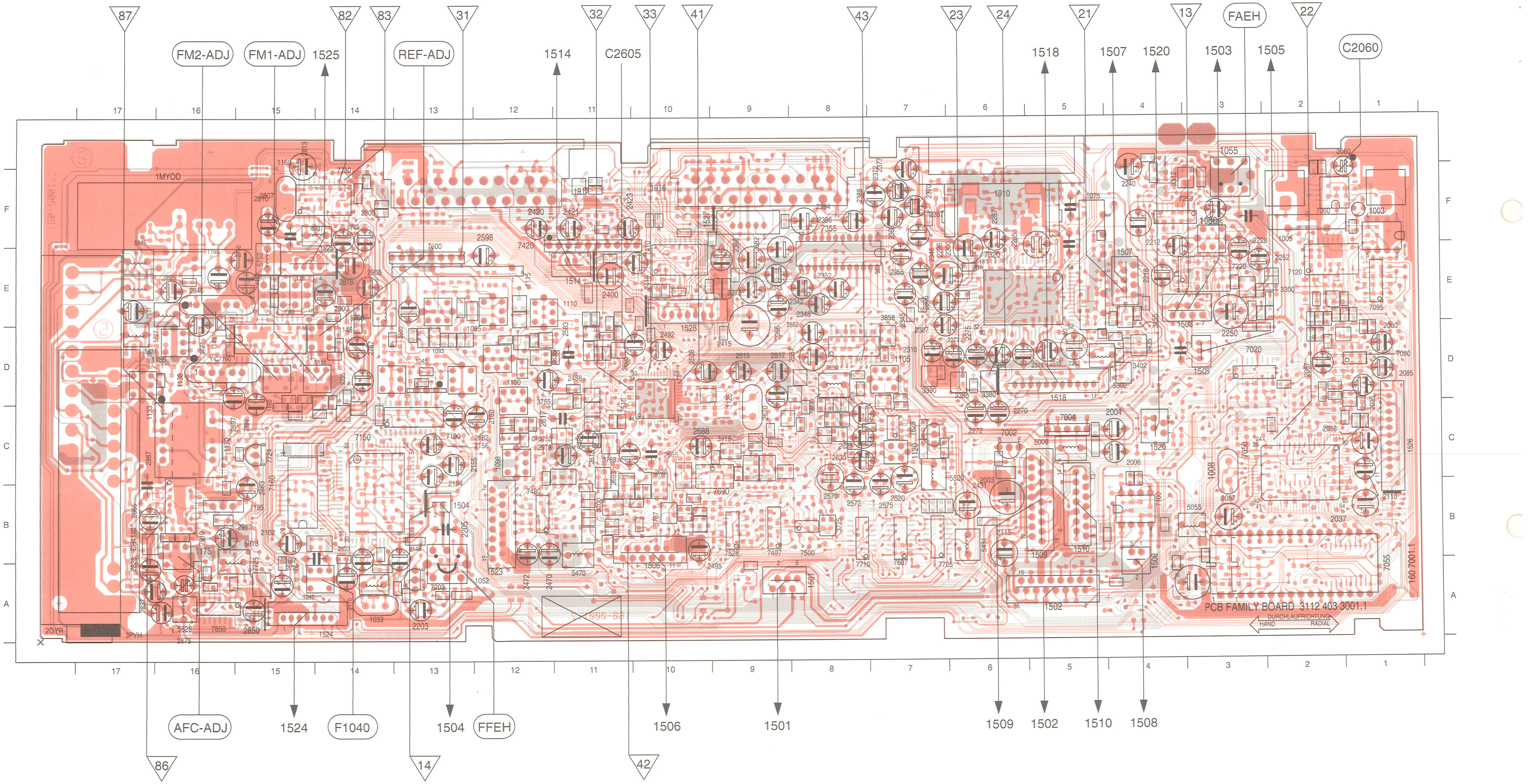
0008	F2
1050	F2
1509	D14
2015	C4
2023	C4
2025	B5
2030	C5
2040	E5
2050	F2
2060	F4
2061	F4
2062	F4
2064	G4
2065	F5
2070	E5
2085	B7
2100	C6
2102	C7
2103	C11
2105	C7
2107	D7
2108	D9
2109	D12
2115	D9
2122	E7
2130	E6
2132	E7
2133	E8
2137	E9
2140	F10
2155	F6
2157	F7
2162	F8
2180	F7
2182	G7
2185	G7
2186	F8
2190	G8
2200	G10
2203	G11
3005	C3
3007	C3
3008	C3
3009	D3
3011	C3
3012	C3
3013	C3
3014	D3
3020	C4
3022	B4
3027	C5
3035	D4
3040	D5
3041	E5
3042	E5
3052	F4
3053	F4
3055	G4
3056	G4
3083	B7
3084	B7
3085	B8
3090	B8
3092	B8
3095	C8
3100	C7
3102	C8
3103	C11
3105	C6
3107	D8
3108	D9
3109	D11
3117	D9
3123	D7
3125	D8
3126	D8
3127	D8
3130	E7
3133	E9
3135	E10
3139	E11
3142	F11
3143	F12
3145	F12
3155	F7
3180	F6
3193	G8
3195	G9
3198	G9
5042	E6
5050	G3
5070	G6
5106	C7
5107	E9
5132	E8
5160	F8
6027	C5
6040	D6
6070	F5
6100	C7
6105	D7
6110	D8
6115	D8
6120	D6
6122	D7
6127	E8
6130	E7
6131	E7
6137	E10
6138	E11
6139	E11
6155	E7
6180	F7
7005	B3
7035	D5
7080	B6
7085	B7
7140	F10
7145	F11
7190	F8

Family Board

BLACK — Components Side
RED — Solder Side

View of Components Side
(Conventional Assembly)

1502, 1503, 1504, 1505, 1508 —> Tape Deck
1501, 1506, 1507 —> Head Amplifier
1509 —> Power Supply
1510 —> Keyboard Unit I
1514, 1518, 1520 —> Keyboard Unit II
1524, 1525 —> NICAM


87
FM2-ADJ
FM1-ADJ
1525
82
83
REF-ADJ
31
1514
32
C2605
33
41
43
23
24
1518
21
1507
1520
13
1503
FAEH
1505
22
C2060
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
F
E
D
C
B
A
PCB FAMILY BOARD 3112 403 3001.1
DURCHLAUFRICHTUNG
HAND
RADIAL
AFC-ADJ
1524
F1040
1504
FFEH
1506
1501
1509
1502
1510
1508
86
14
42

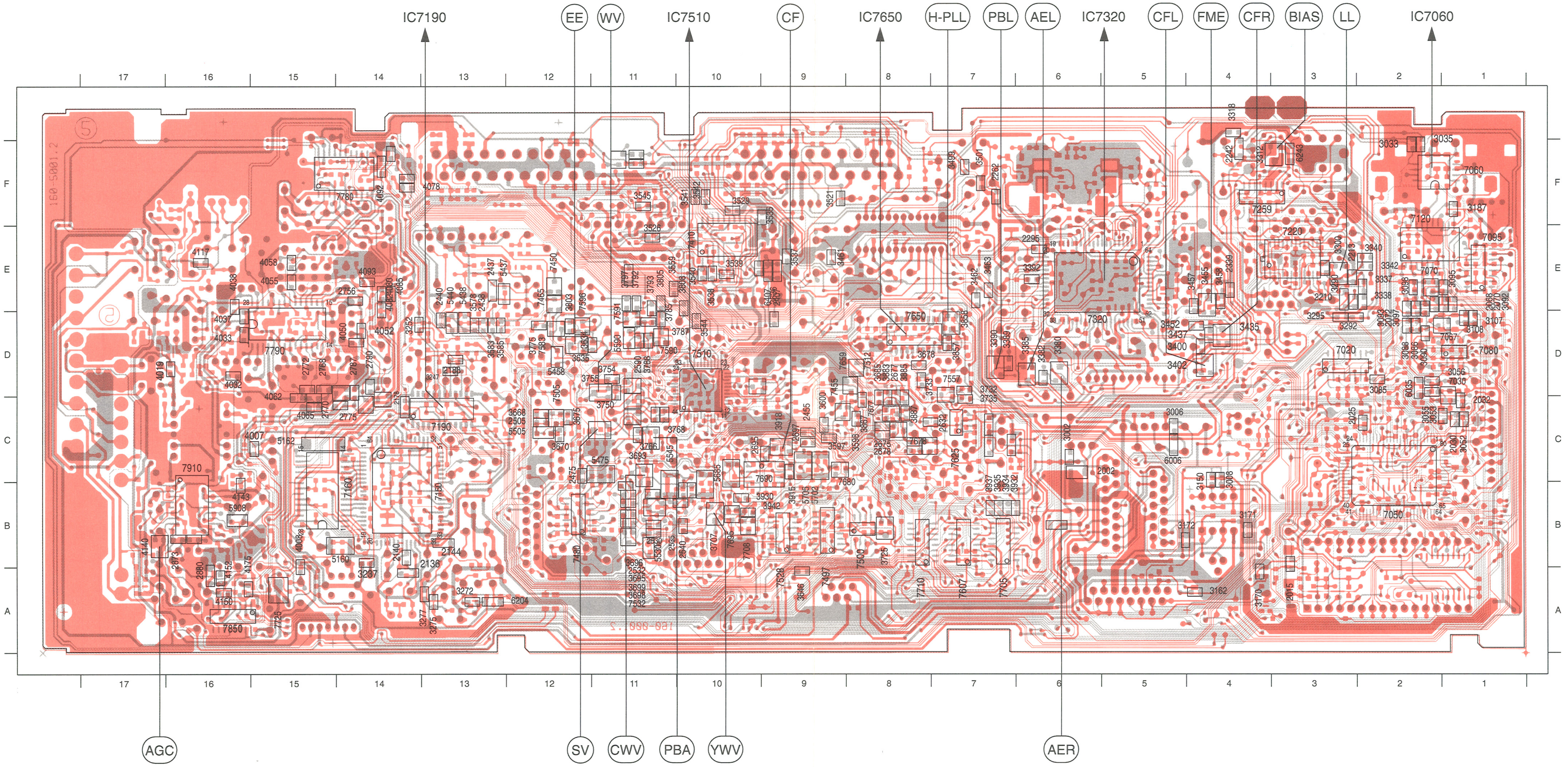
1003	F	1
1005	F	2
1008	C	3
1033	A	14
1040	A	15
1045	D	13
1052	B	13
1055	F	3
1060	F	3
1075	E	5
1093	E	13
1095	E	12
1098	C	12
1100	D	12
1101	D	12
1105	D	7
1110	E	12
1115	E	13
1120	C	7
1125	C	9
1133	D	17
1135	D	16
1138	D	16
1140	E	16
1145	D	14
1147	E	15
1148	E	15
1150	E	15
1152	E	15
1155	D	15
1160	F	15
1165	E	16
1170	C	16
1175	B	16
1180	D	15
1185	B	16
1200	B	17
1201	C	18
1210	F	17
1501	A	9
1502	A	5
1503	E	3
1504	B	13
1505	D	3
1506	B	10
1507	E	4
1508	A	4
1509	B	5
1510	B	5
1514	E	11
1518	D	5
1520	C	4
1523	B	12
1524	A	15
1525	E	15
1526	C	1
1527	F	9
1528	E	10
1901	F	1
1902	F	2
1910	F	6
1916	F	9
1917	F	13
2003	B	6
2004	C	4
2006	C	4
2035	D	1
2037	B	1
2038	C	1
2057	B	3
2060	F	1
2080	D	1
2085	D	1
2087	D	2
2110	C	1
2112	A	3
2115	B	6
2133	B	14
2148	B	13
2154	C	13
2155	C	13
2156	C	13
2162	B	15
2167	B	15
2170	A	14
2180	C	13
2182	C	13
2203	A	13
2205	B	13
2212	E	4
2218	E	4
2228	E	3
2232	F	3
2235	F	4
2240	G	4
2243	D	4
2245	F	3
2250	E	3
2252	E	3
2270	C	6
2272	C	6
2275	D	6
2277	D	6
2282	D	5
2285	F	5
2287	F	6
2292	D	6
2296	E	7
2300	E	6
2305	E	7
2307	E	7
2310	D	7
2313	D	6
2315	D	5
2326	F	5
2331	F	5
2342	E	8
2343	E	9
2345	E	7
2346	E	7
2348	E	8
2352	E	8
2355	E	7
2357	F	7
2362	F	7
2366	E	9
2370	F	7
2372	F	7
2377	G	7
2378	E	9
2382	E	9
2386	F	8
2388	F	7
2390	E	9
2394	F	8
2400	E	11
2410	E	9
2415	E	9
2418	E	10
2420	F	12
2421	F	11
2423	F	11
2431	B	6
2470	B	12
2472	B	12
2488	D	12
2492	D	10
2495	B	10
2508	D	10
2515	D	9
2517	D	9
2520	C	7
2570	C	8
2572	C	8
2575	C	7
2578	C	11
2583	D	11
2598	E	12
2600	E	13
2605	D	11
2617	C	11
2618	C	11
2620	C	11
2625	C	8
2628	C	8
2630	C	8
2652	D	8
2657	D	8
2665	C	10
2670	D	9
2688	C	10
2725	A	15
2727	E	16
2750	E	16
2752	E	15
2755	D	14
2767	D	14
2785	F	14
2803	F	14
2807	F	15
2810	F	15
2813	G	15
2818	E	14
2828	A	17
2831	E	17
2835	A	17
2837	A	17
2840	E	16
2845	E	16
2850	A	15
2863	B	15
2865	B	17
2867	C	17
2875	A	16
2897	D	16
2898	D	15
2900	E	14
2903	E	14
2913	B	16
5006	C	5
5055	B	3
5138	A	14
5187	D	13
5192	D	14
5302	D	5
5431	B	6
5470	B	11
5520	C	7
5658	D	8
5727	E	16
5752	E	15
5798	E	14
5807	F	15
5825	E	17
5828	A	16
5831	D	17
5845	E	17
5913	B	16
7002	C	6
7004	C	5
7055	A	2
7058	F	1
7100	B	4
7203	A	13
7355	E	8
7420	F	11
7525	C	7
7600	E	13
7724	C	15
1PIN	F	5
3PIN	D	5

CS 37426

Family Board

BLACK — Components Side
RED — Solder Side

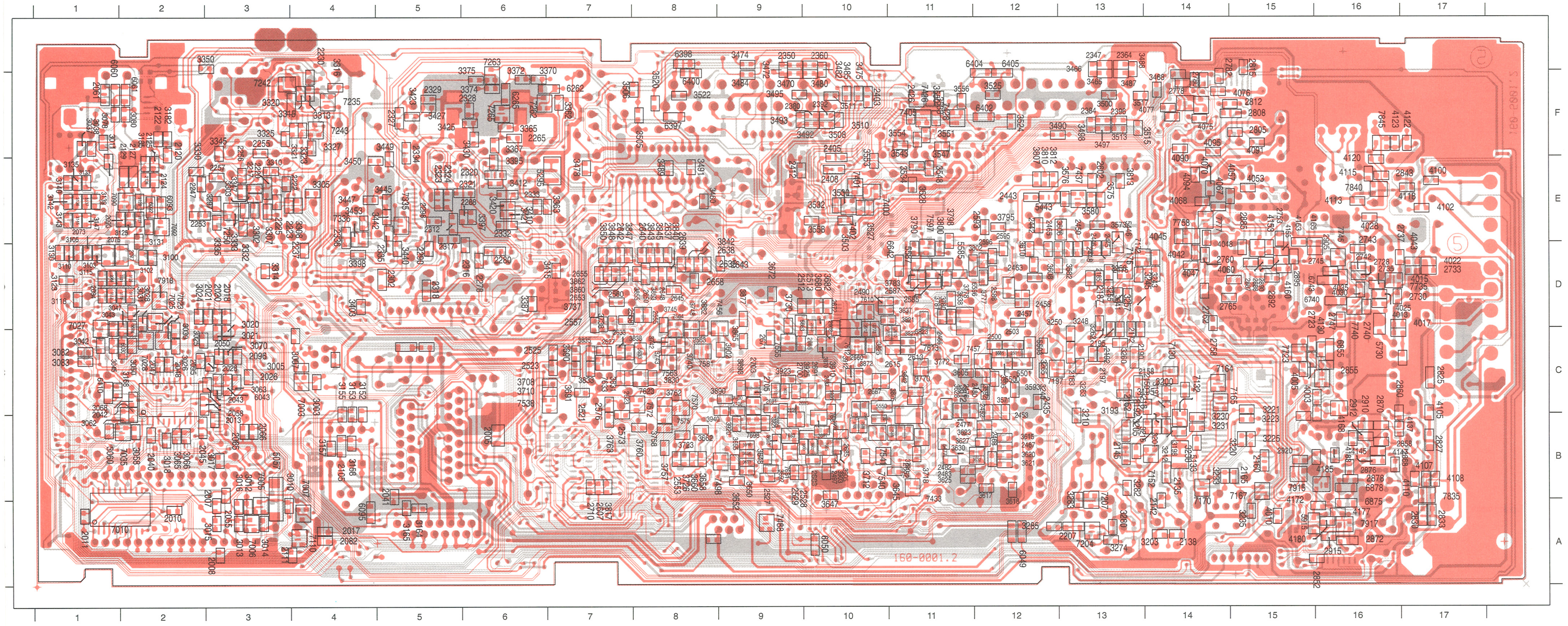
View of Components Side
(Chip Assembly)



2002	C	6
2015	B	3
2025	C	2
2030	C	1
2032	C	1
2068	E	2
2070	E	1
2072	E	2
2136	A	14
2140	B	14
2144	B	13
2178	C	14
2188	D	13
2210	E	3
2213	E	3
2215	E	3
2242	F	4
2262	F	7
2295	E	6
2339	E	4
2401	E	11
2407	E	9
2417	E	10
2437	E	13
2438	D	13
2440	D	13
2455	C	9
2475	C	12
2505	C	12
2530	B	11
2532	B	11
2535	B	11
2540	B	10
2543	B	10
2580	C	11
2590	D	11
2632	C	8
2675	C	8
2677	D	8
2678	C	8
2695	C	9
2697	C	9
2756	E	14
2768	D	15
2770	D	15
2772	D	15
2775	C	15
2787	D	14
2790	D	14
2795	F	14
2873	B	16
2880	A	16
3002	C	6
3006	C	5
3008	C	4
3033	F	2
3035	F	2
3052	C	1
3053	C	1
3055	D	2
3056	D	2
3085	D	2
3086	D	2
3088	D	2
3090	D	2
3092	E	1
3093	E	2
3095	E	1
3097	E	2
3098	E	2
3107	D	1
3108	D	1
3150	C	4
3162	A	4
3170	A	4
3171	B	4
3172	B	5
3187	F	1
3237	B	14
3247	D	13
3252	D	14
3272	A	13
3275	A	13
3277	A	14
3290	E	3
3292	D	3
3295	D	3
3300	E	3
3312	F	3
3318	G	4
3337	E	2
3338	E	2
3340	E	2
3342	E	2
3380	D	6
3382	D	6
3385	D	6
3389	D	7
3390	D	7
3392	E	6
3400	D	4
3402	D	4
3435	D	4
3437	D	4
3452	D	4
3455	E	4
3457	E	4
3458	E	4
3461	E	9
3462	E	7
3463	E	7
3499	F	7
3501	F	7
3519	F	11
3521	F	9
3523	F	11
3526	E	11
3529	F	10
3535	F	10
3536	D	9
3537	E	9
3538	E	10
3539	E	10
3540	E	10
3541	F	10
3542	F	10
3544	D	10
3545	F	11
3559	E	11
3578	D	13
3583	D	13
3585	D	13
3597	C	9
3598	C	8
3600	C	9
3634	D	12
3635	D	12
3646	A	9
3668	C	12
3670	C	12
3675	C	12
3678	D	8
3685	D	8
3687	C	7
3688	C	7
3689	C	7
3693	C	11
3695	B	11
3696	B	11
3698	B	11
3699	B	11
3700	B	11
3702	B	11
3707	B	10
3714	B	10
3715	B	10
3725	B	8
3731	C	8
3732	D	7
3733	D	8
3735	C	7
3739	C	8
3750	D	11
3752	C	11
3754	D	11
3755	D	11
3765	C	11
3766	C	11
3768	C	11
3775	D	12
3785	D	11
3787	D	11
3788	D	11
3792	E	11
3793	E	11
3797	E	11
3803	D	12
3805	E	11
3808	E	10
3857	D	7
3858	D	7
3867	C	8
3883	D	8
3885	D	8
3887	C	8
3915	C	9
3918	C	9
3930	B	10
3932	B	7
3934	B	7
3935	B	7
3937	B	7
3942	B	10
4007	C	16
4008	B	15
4019	D	17
4032	D	16
4033	D	16
4037	D	16
4038	E	16
4050	D	14
4052	D	14
4055	E	15
4058	E	15
4062	D	15
4065	C	15
4072	F	14
4078	F	14
4080	E	14
4082	E	14
4085	E	14
4092	F	14
4093	E	14
4117	E	16
4140	B	17
4143	B	16
4150	A	16
4151	B	16
4152	A	16
4175	A	16
5160	B	15
5162	C	15
5437	E	13
5438	D	13
5440	D	13
5458	D	12
5475	C	11
5505	C	12
5530	B	11
5545	B	11
5549	B	10
5590	D	11
5685	C	10
5702	C	9
5705	C	9
5908	B	16
6006	C	5
6029	B	6
6035	D	2
6204	A	13
6243	F	3
6407	E	9
6580	D	11
6581	C	11
7020	D	3
7030	D	1
7050	C	2
7060	F	2
7067	D	1
7070	E	2
7080	D	1
7095	E	1
7120	E	2
7150	B	14
7160	B	15
7190	C	13
7220	E	3
7259	F	4
7320	E	6
7398	F	11
7410	E	10
7450	E	12
7455	C	9
7465	E	12
7480	B	12
7497	B	9
7500	B	8
7505	C	12
7510	D	10
7512	D	8
7528	B	9
7532	B	11
7557	D	7
7558	C	8
7576	C	11
7583	D	12
7590	D	11
7591	D	11
7596	D	12
7607	B	7
7625	C	7
7650	D	8
7659	D	8
7672	D	10
7677	C	8
7678	C	8
7680	C	9
7690	C	10
7695	B	10
7705	B	7
7708	B	10
7710	B	8
7725	A	15
7775	D	15
7780	F	14
7787	C	14
7788	C	14
7790	D	15
7850	A	16
7910	B	16

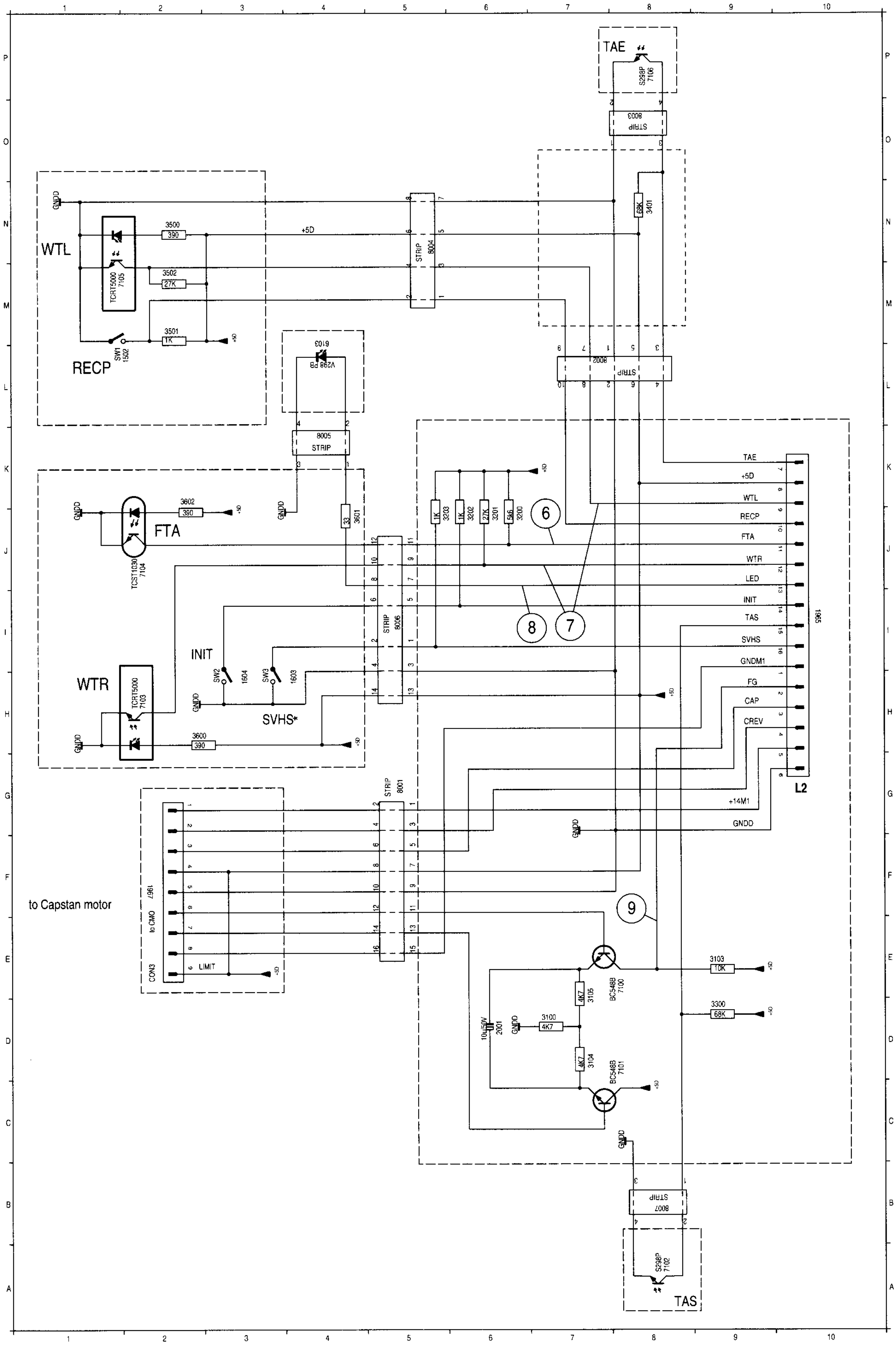
View of Solder Side

2005	B	6
2007	A	3
2008	A	3
2010	A	2
2011	A	1
2013	B	3
2017	A	4
2018	D	3
2020	D	3
2021	D	3
2026	C	3
2028	C	3
2040	B	2
2041	B	5
2042	C	2
2043	C	3
2045	B	2
2047	C	2
2048	C	2
2050	C	3
2055	B	3
2058	C	2
2061	F	1
2065	B	3
2066	B	3
2073	D	1
2075	D	1
2077	D	2
2082	A	4
2083	A	8
2084	D	1
2088	D	1
2090	E	2
2092	E	2
2095	C	2
2096	C	3
2105	B	4
2111	A	4
2120	F	2
2122	F	2
2124	E	2
2125	E	2
2126	E	2
2127	E	2
2129	E	2
2135	B	14
2138	A	14
2142	A	14
2145	B	13
2150	C	13
2152	B	13
2158	C	13
2160	B	15
2165	B	15
2172	D	13
2175	D	13
2183	C	13
2185	D	13
2187	D	13
2190	D	14
2192	D	13
2195	C	13
2197	C	13
2207	A	13
2217	E	3
2220	E	3
2222	E	3
2223	E	3
2225	E	3
2230	F	4
2237	D	4
2247	E	2
2253	E	2
2255	F	3
2256	E	3
2257	E	3
2265	F	6
2278	D	6
2280	D	6
2288	E	6
2290	D	5
2298	E	5
2302	D	5
2312	E	5
2316	E	6
2317	E	5
2318	D	5
2320	E	6
2321	E	6
2323	E	5
2324	E	5
2327	F	5
2328	F	6
2329	F	5
2332	E	6
2333	E	6
2334	F	5
2335	E	5
2336	E	4
2347	G	13
2350	G	9
2360	G	10
2364	G	13
2380	F	10
2384	F	13
2392	F	10
2396	F	13
2403	F	10
2405	F	10
2408	E	10
2409	F	11
2412	E	10
2426	F	11
2435	C	12
2442	E	12
2443	E	12
2445	D	13
2446	D	13
2448	D	13
2450	D	13
2451	D	11
2452	C	12
2453	C	12
2457	D	12
2458	D	12
2461	D	12
2463	D	12
2465	D	12
2467	B	12
2468	B	12
2476	C	11
2477	B	12
2480	C	12
2482	B	11
2483	B	11
2486	D	11
2490	D	11
2493	D	10
2497	B	10
2500	C	12
2501	C	12
2503	C	12
2510	C	10
2512	D	10
2513	D	10
2521	C	7
2523	C	7
2525	C	7
2527	B	9
2528	B	10
2529	B	9
2538	B	10
2542	B	10
2548	C	10
2550	B	11
2551	C	11
2552	B	11
2553	B	8
2555	D	8
2557	D	7
2558	D	8
2560	D	7
2561	D	7
2563	C	8
2573	C	7
2576	C	7
2585	D	11
2586	D	12
2587	D	11
2593	E	12
2595	D	12
2596	D	12
2602	E	13
2607	B	7
2610	C	11
2612	D	10
2613	C	11
2615	C	11
2623	C	7
2627	C	7
2633	C	7
2635	D	8
2637	D	8
2638	D	8
2639	D	8
2640	D	8
2642	D	7
2643	D	9
2645	D	8
2648	D	8
2650	D	8
2653	D	7
2655	D	7
2658	D	8
2660	C	10
2662	C	10
2663	D	10
2667	C	10
2668	C	10
2671	C	9
2672	D	10
2681	C	9
2683	B	10
2685	B	10
2687	C	10
2690	B	9
2691	C	10
2693	B	9
2700	C	9
2702	C	9
2703	C	9
2705	C	9
2708	C	9
2710	B	7
2723	C	16
2728	D	16
2730	D	17
2733	D	17
2735	D	16
2737	D	17
2740	D	16
2742	D	16
2743	D	16
2745	D	16
2747	D	16
2753	E	15
2758	D	14
2760	D	14
2762	D	14
2765	D	15
2778	F	14
2780	F	14
2781	F	14
2782	F	14
2793	F	14
2805	F	15
2808	F	15
2812	F	15
2815	G	15
2825	C	17
2827	B	17
2830	A	17
2833	A	17
2843	E	16
2852	A	16
2855	C	16
2858	B	16
2860	C	17
2864	B	15
2868	B	16
2870	B	16
2872	A	16
2876	B	16
2878	B	16
2885	D	15
2887	D	15
2888	D	15
2890	D	15
2892	D	15
2895	D	15
2905	D	16
2910	B	16
2912	B	16
2915	A	16
2920	B	15
3003	C	4
3005	C	4
3007	C	4
3009	C	5
3010	A	3
3011	F	1
3012	A	3
3013	A	3
3014	A	3
3015	A	3
3016	A	3
3017	B	3
3018	B	2
3019	E	1
3020	C	3
3021	C	3
3024	D	2
3025	C	2
3026	C	2
3028	D	2
3029	C	4
3030	D	2
3031	D	2
3037	F	1
3038	F	1
3040	C	3
3042	C	1
3043	D	1
3045	C	1
3047	D	2
3048	D	2
3050	C	2
3058	B	2
3060	B	1
3062	C	2
3063	C	3
3065	B	2
3066	B	2
3068	C	2
3070	C	3
3078	F	1
3080	F	2
3082	C	1
3083	C	1
3100	D	2
3102	D	2
3103	D	1
3105	D	1
3110	D	1
3112	D	2
3113	D	1
3115	D	1
3117	D	2
3118	D	1
3120	D	2
3121	D	2
3123	D	1
3125	E	2
3127	E	2
3128	E	2
3130	D	1
3131	E	2
3133	E	1
3135	E	1
3136	E	1
3137	E	1
3139	E	1
3140	E	1
3142	E	1
3143	E	1
3145	E	1
3147	E	1
3152	C	4
3153	C	4
3155	C	4
3157	B	4
3158	B	4
3164	A	5
3165	A	5
3168	C	1
3182	F	2
3185	E	2
3192	C	13
3193	C	13
3195	C	14
3197	C	14
3198	B	14
3200	C	14
3201	B	14
3203	A	14
3205	B	13
3210	B	13
3212	B	14
3215	C	14
3216	B	14
3220	B	15
3221	C	15
3223	B	15
3225	B	15
3230	B	14
3231	B	14
3233	B	14
3235	A	15
3238	B	14
3240	C	12
3241	D	13
3243	D	14
3245	D	14
3248	D	13
3250	C	13
3255	D	13
3257	D	13
3258	D	13

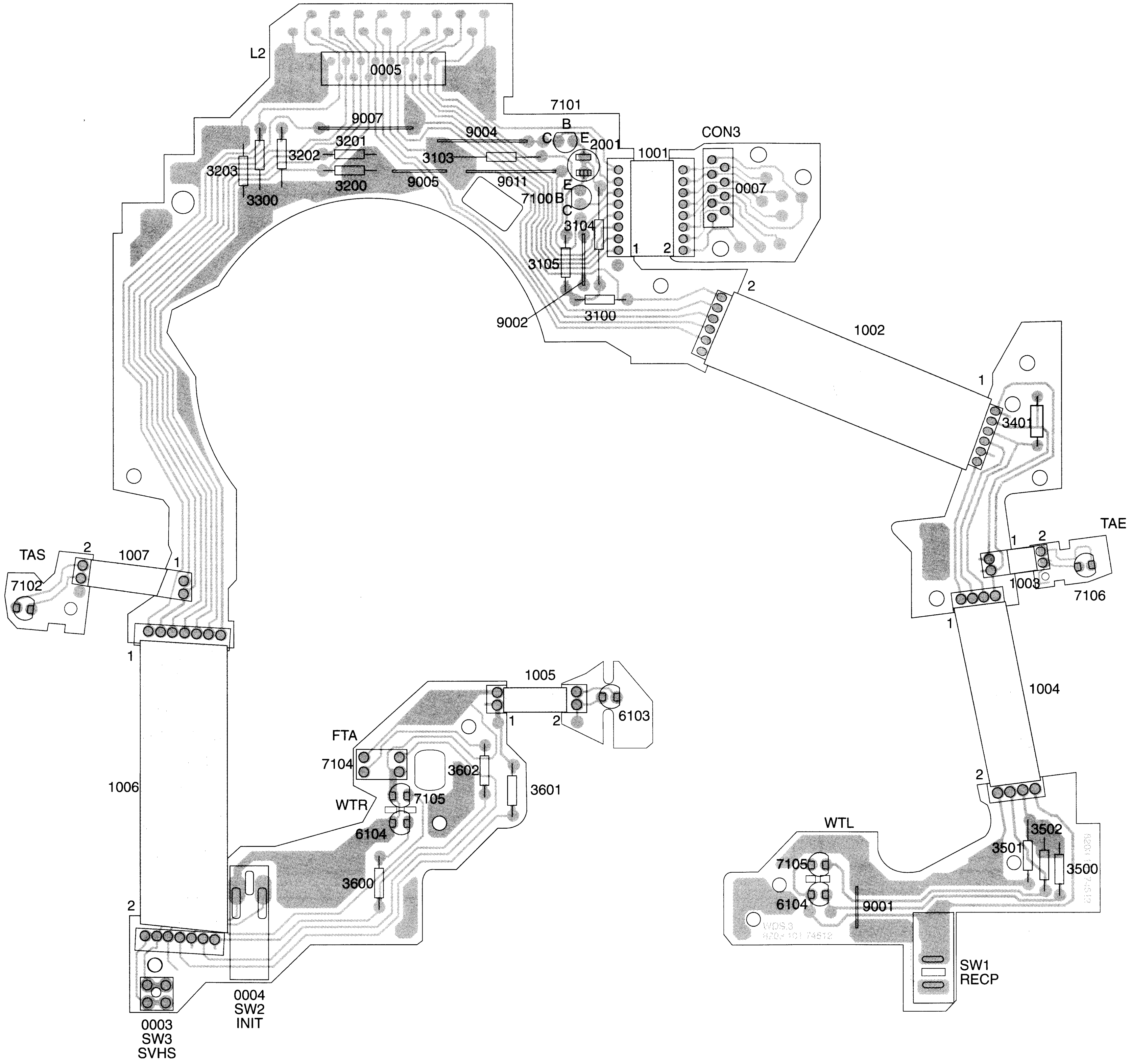


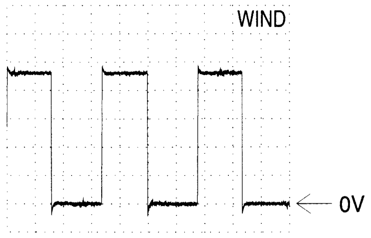
3260	D	13
3262	C	13
3263	C	13
3265	C	12
3274	A	13
3280	A	13
3282	B	13
3283	B	13
3285	A	12
3297	E	3
3302	E	3
3303	E	3
3305	E	4
3307	E	3
3308	E	4
3310	E	3
3313	F	4
3314	D	3
3315	F	4
3316	F	4
3320	F	4
3321	F	4
3323	F	4
3325	F	3
3327	F	4
3330	E	2
3332	E	3
3333	E	3
3335	E	3
3345	F	3
3347	E	3
3350	G	3
3362	F	7
3363	E	7
3365	F	6
3367	F	6
3370	F	6
3372	F	6
3374	F	6
3375	F	6
3387	D	6
3395	E	6
3397	E	6
3398	D	4
3403	D	4
3410	E	6
3412	E	6
3415	D	7
3420	E	6
3421	E	6
3423	F	5
3425	F	6
3427	F	5
3430	F	6
3440	D	5
3442	E	5
3445	E	5
3447	E	4
3449	F	5
3450	E	5
3453	E	4
3460	E	8
3465	G	13
3466	G	13
3468	F	14
3470	G	9
3472	G	9
3474	G	9
3475	F	10
3478	E	7
3480	G	10
3482	G	10
3484	F	9
3485	F	10
3487	G	13
3488	G	13
3489	E	8
3490	F	13
3491	E	8
3492	F	10
3493	F	10
3495	F	9
3497	F	13
3498	F	13
3500	F	13
3503	E	10
3505	F	8
3506	F	8
3508	F	10
3510	F	10
3511	F	10
3513	F	13
3515	F	13
3517	F	14
3520	F	8
3522	F	8
3524	F	12
3525	F	12
3527	E	10
3528	E	11
3530	E	10
3532	E	10
3533	F	11
3534	E	11
3543	F	11
3547	F	11
3548	E	11
3550	F	11
3551	F	11
3553	E	10
3554	F	11
3556	F	11
3558	E	10
3571	C	12
3573	E	13
3575	E	13
3576	E	13
3580	E	13
3582	D	13
3592	C	12
3593	C	12
3595	C	12
3602	C	9
3604	D	12
3605	C	12
3606	D	13
3608	D	13
3610	D	12
3612	C	11
3615	B	12
3617	B	12
3618	B	12
3620	B	12
3621	B	12
3623	B	12
3625	B	11
3627	B	12
3628	C	11
3630	B	12
3632	B	12
3637	D	11
3638	D	11
3642	C	11
3645	B	11
3647	B	10
3648	B	9
3650	B	9
3652	B	9
3653	B	9
3655	B	9
3656	B	9
3658	B	8
3660	B	8
3662	B	8
3665	C	12
3672	D	9
3680	D	10
3682	D	10
3690	C	7
3691	C	7
3692	B	9
3705	B	10
3708	C	7
3710	C	7
3712	B	10
3713	C	10
3718	B	11
3719	C	11
3720	B	11
3723	B	8
3726	B	8
3730	D	9
3736	D	7
3737	D	7
3738	D	7
3740	C	8
3742	C	8
3743	C	8
3745	D	8
3748	D	8
3757	B	8
3758	B	8
3760	B	8
3762	C	8
3763	B	7
3764	C	11
3770	C	11
3772	C	11
3773	D	10
3777	D	12
3778	D	11
3780	D	11
3781	D	11
3783	D	11
3790	D	11
3795	E	12
3798	E	11
3800	D	11
3802	D	12
3807	E	12
3810	E	12
3812	E	12
3813	E	13
3817	B	7
3820	C	11
3821	D	11
3823	D	11
3825	C	10
3827	C	11
3830	C	8
3831	C	7
3833	C	7
3835	C	7
3838	C	7
3840	D	8
3842	D	8
3843	D	8
3845	D	8
3847	D	7
3848	D	7
3850	D	7
3853	D	8
3855	D	8
3860	D	7
3862	D	7
3865	C	9
3870	C	10
3872	C	10
3875	C	10
3877	D	9
3880	D	10
3882	D	8
3890	C	9
3892	B	9
3893	C	9
3895	C	9
3897	B	10
3900	B	10
3902	B	10
3903	B	10
3905	B	10
3906	C	10
3908	B	10
3910	C	10
3912	C	10
3916	B	9
3920	B	9
3921	B	9
3923	C	9
3925	C	10
3927	C	9
3940	C	9
4003	C	16
4005	C	15
4010	A	15
4013	D	16
4015	D	17
4017	D	17
4022	D	17
4025	D	16
4028	E	16
4030	D	16
4035	D	16
4042	D	14
4043	D	17
4045	E	14
4047	D	14
4048	E	14
4053	E	15
4057	E	15
4060	D	15
4067	E	14
4068	E	14
4070	E	14
4075	F	14
4076	F	14
4077	F	14
4087	F	14
4090	F	14
4091	F	15
4094	E	14
4095	F	14
4100	E	17
4102	E	17
4105	C	17
4107	B	17
4108	B	17
4110	B	17
4113	E	16
4115	E	16
4118	E	17
4120	E	16
4122	F	17
4123	F	17
4130	C	16
4133	C	17
4135	C	17
4137	B	17
4142	C	16
4144	C	16
4145	B	16
4147	B	16
4153	D	15
4155	D	15
4160	D	15
4163	E	15
4165	E	16
4168	B	16
4172	A	16
4177	A	16
4180	A	16
4183	B	16
4185	B	16
5057	B	3
5133	B	14
5295	E	7
5443	E	12
5445	E	13
5446	E	13
5450	D	11
5461	D	12
5477	B	11
5480	C	11
5500	C	12
5501	C	12
5503	C	12
5550	C	10
5551	C	11
5585	D	11
5587	D	11
5633	C	8
5663	D	10
5730	D	16
5915	A	16
6007	C	5
6028	A	12
6030	C	2
6043	C	3
6049	A	12
6050	A	10
6060	F	1
6061	F	2
6092	E	2
6093	E	2
6095	A	4
6110	C	1
6262	F	7
6265	F	6
6397	F	8
6398	G	8
6400	G	8
6402	F	12
6404	G	12
6405	G	12
6596	D	12
6642	D	11
6740	D	16
6743	D	16
6855	C	16
6875	A	16
6878	B	16
7003	C	4
7005	A	3
7006	A	3
7007	A	4
7010	A	1
7023	C	2
7025	D	2
7027	D	1
7028	C	2
7035	B	2
7040	C	2
7090	E	2
7092	E	2
7110	A	4
7130	C	14
7132	B	14
7152	B	14
7164	C	14
7165	C	14
7167	B	15
7170	B	14
7172	D	13
7175	D	14
7197	C	13
7204	A	13
7207	B	13
7235	F	4
7242	F	3
7243	F	4
7250	E	3
7262	F	6
7263	F	6
7265	F	6
7335	E	5
7336	E	4
7400	E	10
7401	E	10
7402	E	10
7405	F	11
7426	F	11
7428	F	11
7433	B	11
7437	E	13
7456	D	9
7457	C	12
7488	A	9
7498	B	9
7538	C	7
7540	B	10
7541	B	10
7543	B	11
7555	C	9
7563	C	8
7564	D	8
7570	C	8
7572	C	8
7575	C	8
7581	C	8
7597	D	11
7610	D	10
7612	C	10
7613	C	11
7623	C	8
7633	C	7
7681	B	9
7683	B	9
7685	B	10
7687	B	10
7698	B	9
7700	C	9
7723	C	15
7735	D	16
7740	D	16
7745	D	16
7758	E	14
7777	E	14
7778	F	14
7795	F	14
7835	B	17
7840	E	16
7845	F	16
7855	C	16
7885	D	15
7912	C	16
7915	B	16
7917	A	16
7918	D	2
7920	B	15

Tape Deck Sensor Panel


TAE
S298P 7106
STRIP 8003
68K 3401
GNDD
WTL
TCRT5000 7105
3500 390
3502 27K
3501 1K
+5D
SW1 1502
RECP
STRIP 8004
V298 PB 6103
8005 STRIP
STRIP 8002
GNDD
3602 390
FTA
TCST1030 7104
33 3601
1K 3203
1K 3202
27K 3201
5K6 3200
6
7
8
INIT
SW2 1604
SW3 1603
SVHS*
WTR
TCRT5000 7103
3600 390
STRIP 8006
TAE
+5D
WTL
RECP
FTA
WTR
LED
INIT
TAS
SVHS
GNDM1
FG
CAP
CREV
1965
L2
+14M1
GNDD
STRIP 8001
to Capstan motor
1967
to CMO
CON3
LIMIT
9
BC548B 7100
3103 10K
3105 4K7
3100 4K7
10u50V 2001
3104 4K7
BC548B 7101
3300 68K
STRIP 8007
S298P 7102
TAS

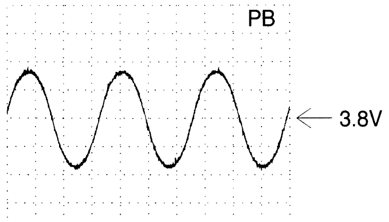
SW1	L 1
MP101	K 9
8007	B 8
8006	I 5
8005	K 4
8004	N 5
8003	O 8
8002	L 7
8001	G 5
7106	P 8
7105	M 1
7104	J 2
7103	H 2
7102	A 8
7101	D 8
7100	E 8
6103	L 4
3602	K 2
3601	J 4
3600	H 2
3502	M 2
3501	M 2
3500	N 2
3401	N 8
3300	D 9
3203	J 5
3202	J 6
3201	J 6
3200	J 6
3105	E 7
3104	D 7
3103	E 9
3100	D 7
2001	D 6
1969	A 7
1968	A 6
1967	F 2
1965	I 10
1604	H 3
1603	H 4


L2
0005
9007
7101
B
C
E
2001
1001
CON3
3201
3203
3202
3103
9004
3300
3200
9005
9011
7100
B
E
C
0007
3104
1
2
3105
9002
3100
2
1002
1
3401
TAE
1
2
1003
7106
1
1004
TAS
2
1007
1
7102
1
1006
2
1005
6103
1
2
FTA
7104
3602
3601
WTR
7105
6104
3600
0003
SW3
SVHS
0004
SW2
INIT
WTL
7105
6104
9001
3501
3502
3500
2
SW1
RECP



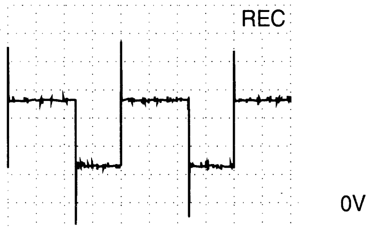
A: DC, 1V/Div, 2ms/Div
IC 7050 Pin 7/8

⑤



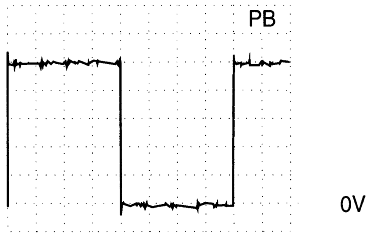
A: AC, 500mV/Div, 200us/Div
Connector 1502, 15, FG

⑨



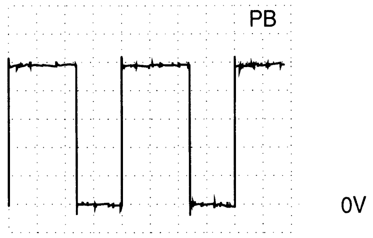
A: DC, 1 V/Div, 10ms/Div
Connector 1503, 7 CTL

13



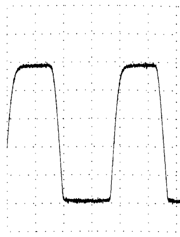
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 13 HI-B

17



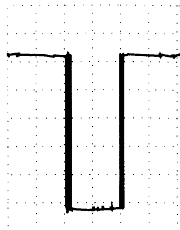
A: DC, 1 V/Div, 10ms/Div
IC 7050 Pin 11/16 CTLOUT

21



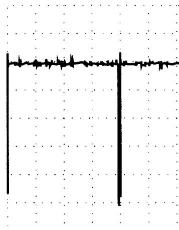
A: DC, 1 V/Div, 5m
Connector 1502, 6

⑥



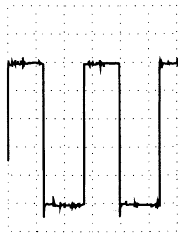
A: DC, 1 V/Div, 10
IC 7050 Pin 17

10



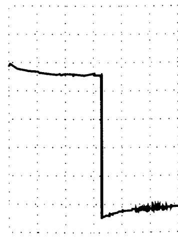
A: DC, 1 V/Div, 10
IC 7050 Pin 1

14



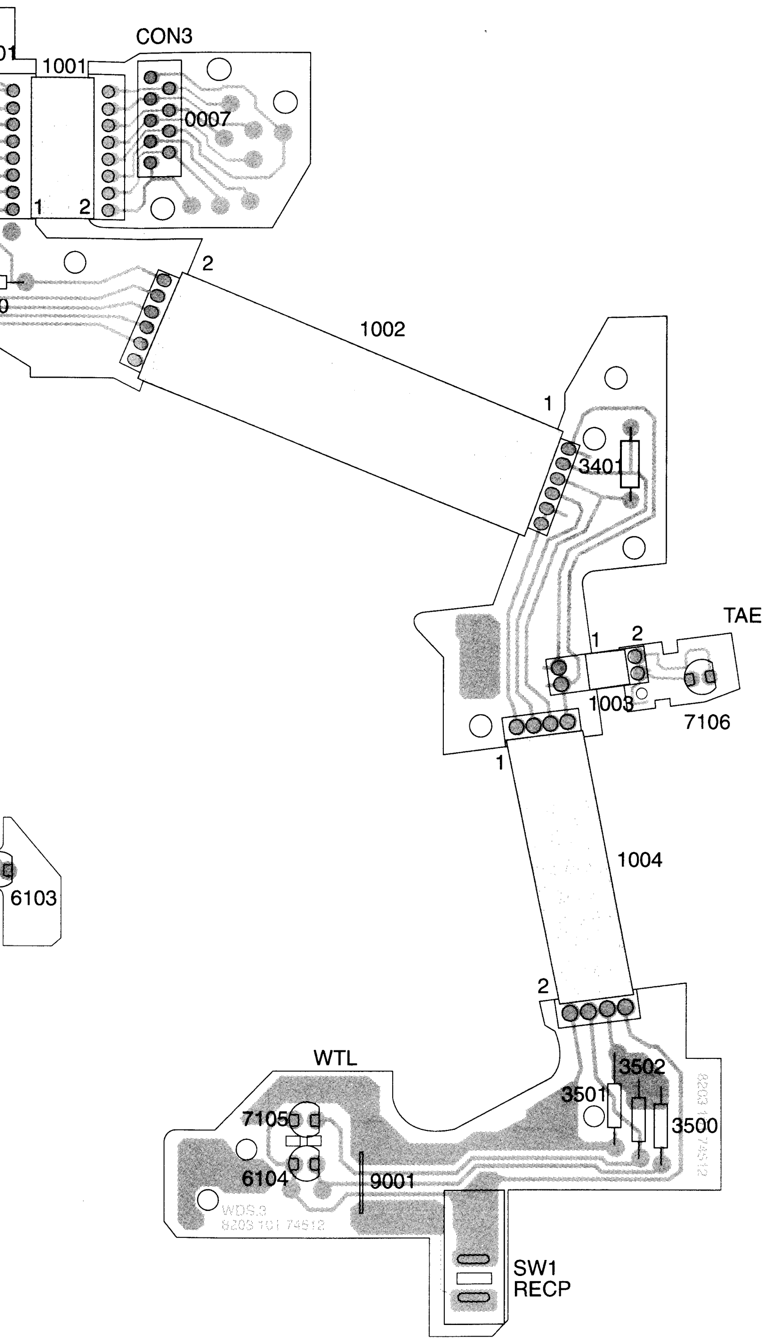
A: DC, 1 V/Div, 5m
IC 7050 Pin 6 FTA

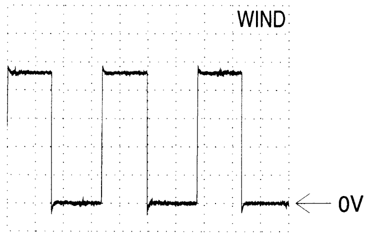
18



A: DC, 1 V/Div, 10
IC 7050 Pin 9

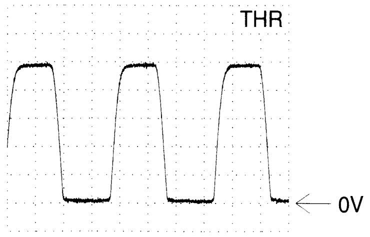
22


CON3
1001
0007
1
2
2
1002
1
3401
TAE
1
2
1003
7106
1
1004
6103
2
WTL
3502
3501
3500
7105
6104
9001
SW1
RECP



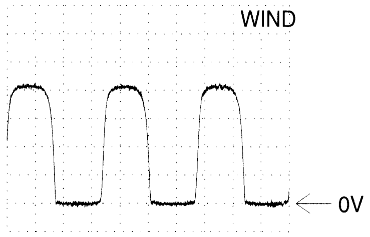
A: DC, 1V/Div, 2ms/Div
IC 7050 Pin 7/8

⑤



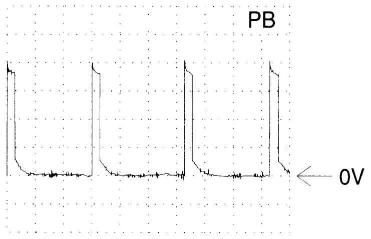
A: DC, 1 V/Div, 5ms/Div
Connector 1502, 6 FTA (Threading)

⑥



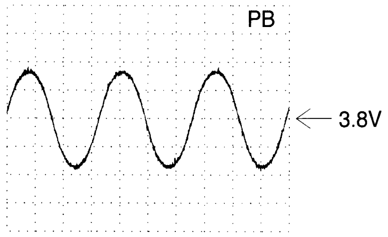
A: DC, 1 V/Div, 2ms/Div
Connector 1502, 5/8 WT2/WT1

⑦



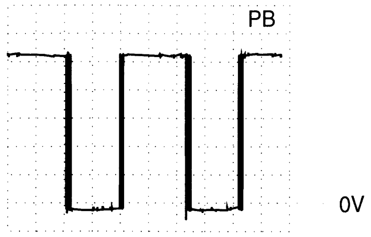
A: DC, 1 V/Div, 5ms/Div
Connector 1502, 4 LED

⑧



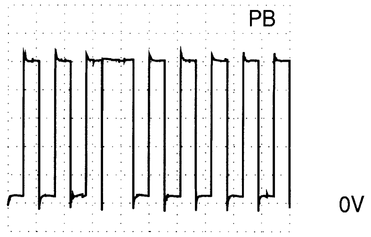
A: AC, 500mV/Div, 200us/Div
Connector 1502, 15, FG

⑨



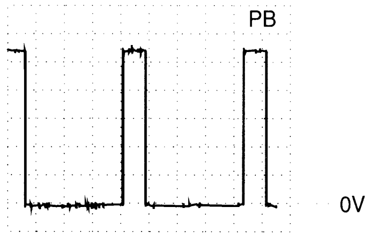
A: DC, 1 V/Div, 10us/Div
IC 7050 Pin 17

10



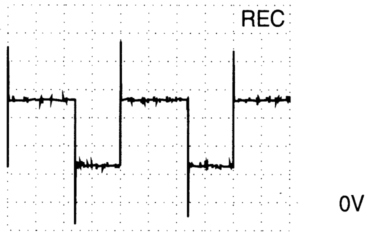
A: DC, 1 V/Div, 2ms/Div
Connector 1501, 1 PG/FG

11



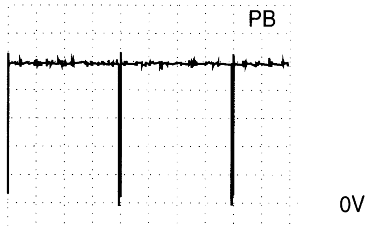
A: DC, 1 V/Div, 10us/Div
IC 7050 Pin 18

12



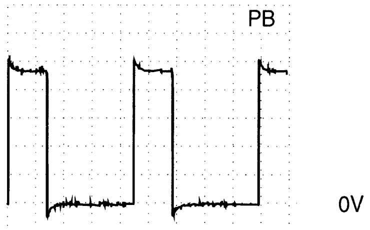
A: DC, 1 V/Div, 10ms/Div
Connector 1503, 7 CTL

13



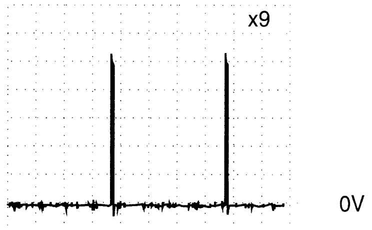
A: DC, 1 V/Div, 10ms/Div
IC 7050 Pin 1

14



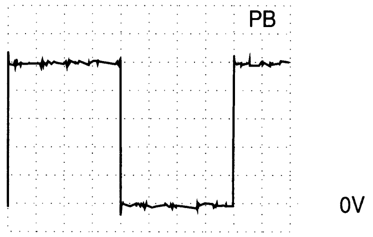
A: DC, 1 V/Div, 500us/Div
IC 7050 Pin 10

15



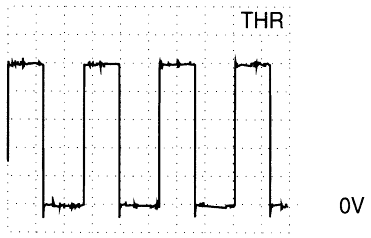
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 15 V-EIN

16



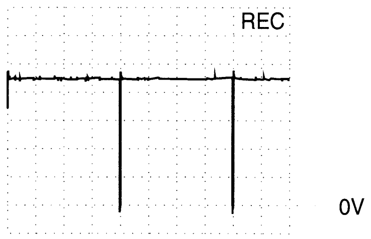
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 13 HI-B

17



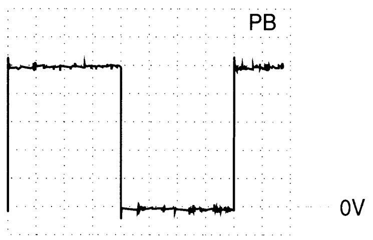
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 6 FTAD

18



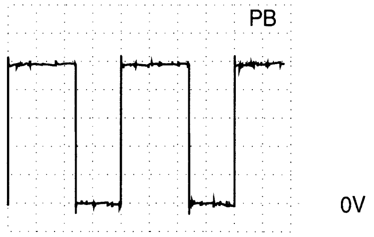
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 12

19



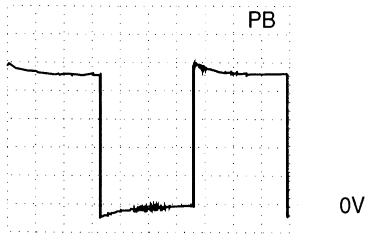
A: DC, 1 V/Div, 5ms/Div
IC 7015 Pin 14 HITON

20



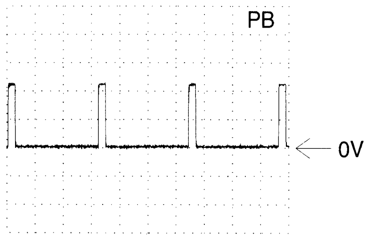
A: DC, 1 V/Div, 10ms/Div
IC 7050 Pin 11/16 CTLOUT

21



A: DC, 1 V/Div, 100us/Div
IC 7050 Pin 9

22

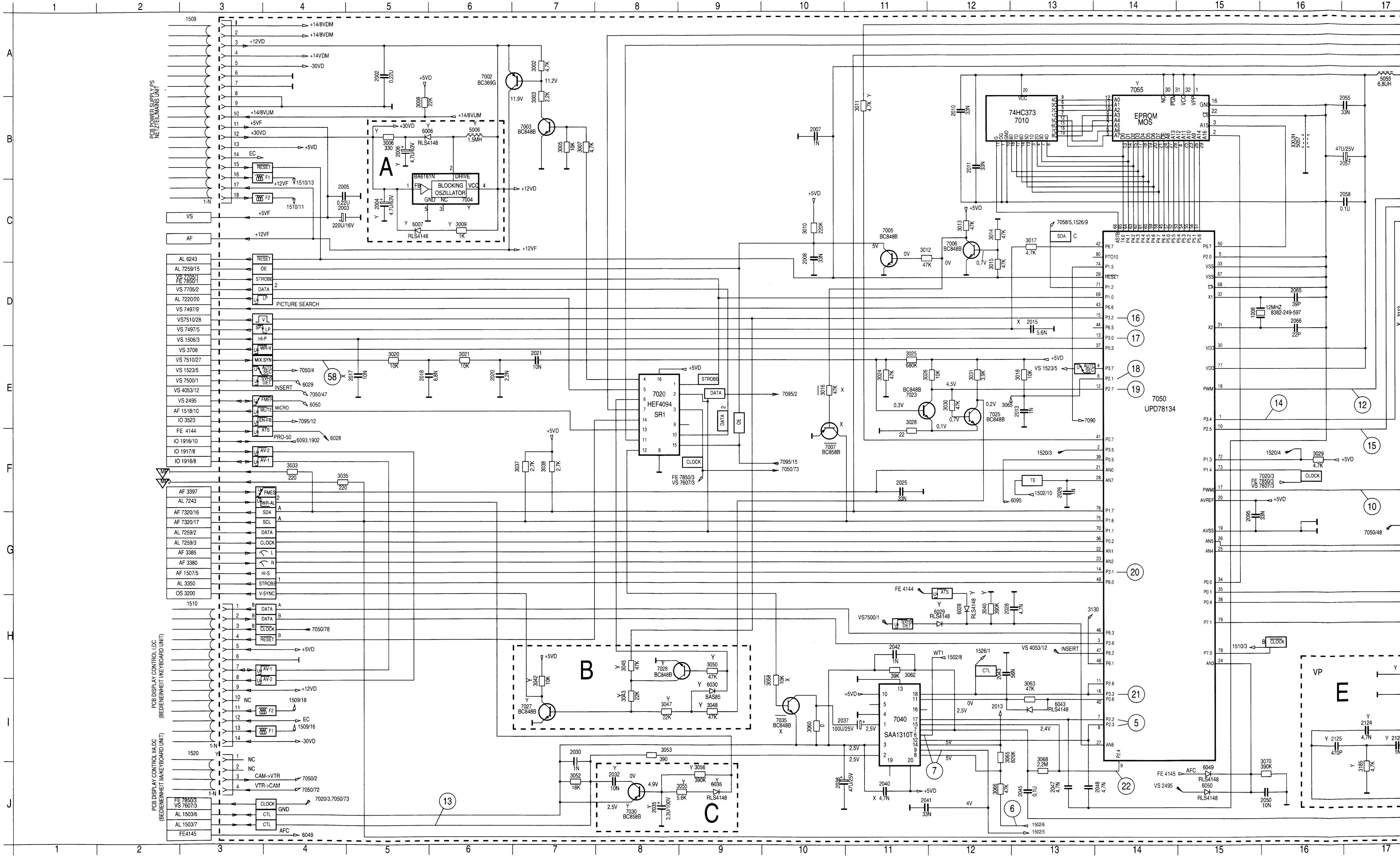


A: DC, 2 V/Div, 20us/Div
IC 7510 Pin 27

(58)

Family Board – Sequence Control / Deck Electronic (DE)

1003	A20
1005	B22
1008	D15
1501	D26
1502	G26
1508	E26
1509	A3
1510	H3
1520	I3
1526	A26
1901	A26
1902	A26
2002	A5
2003	C4
2004	C5
2005	C4
2006	B5
2007	B10
2008	C10
2010	B12
2011	B12
2013	E13
2015	D13
2017	E5
2018	E5
2020	E6
2021	E7
2025	F11
2026	F13
2028	H12
2030	I7
2032	J8
2035	J8
2037	I10
2038	J10
2040	J11
2041	J11
2042	H11
2043	H12
2045	J13
2047	J13
2048	J14
2050	J16
2055	B17
2057	B17
2058	C17
2060	A21
2061	B21
2065	D16
2066	D16
2068	D21
2070	D21
2072	C22
2073	B24
2075	B23
2077	C23
2080	D23
2082	D24
2083	D25
2084	E18
2085	E18
2087	C18
2088	C19
2090	F18
2092	F18
2095	G15
2096	G22
2105	F24
2110	H20
2111	I20
2112	I21
2115	H25
2120	H18
2122	I18
2124	I17
2125	I16
2126	I17
2127	I18
2129	I20
3002	A7
3003	B7
3005	B7
3006	B5
3007	B7
3008	B5
3009	C6
3010	C10
3011	B11
3012	C11
3013	C12
3014	C12
3015	D12
3016	E10
3017	C13
3018	E13
3019	A19
3020	E5
3021	E6
3024	E11
3025	E11
3026	E11
3028	E11
3029	F16
3030	E12
3031	E12
3033	F4
3035	F4
3037	F7
3038	F7
3040	H12
3042	I7
3043	I8
3045	H8
3047	I8
3048	I9
3050	H9
3052	J7
3053	I8
3055	J9
3056	J9
3058	I10
3060	I10
3062	H11
3063	I13
3065	I12
3066	J12
3068	I13
3070	J16
3078	A22
3080	A22
3082	B25
3083	C25
3085	C20
3086	C20
3088	D20
3090	C21
3092	C21
3093	D21
3095	C22
3097	C22
3098	D22
3100	B22
3102	C23
3103	B23
3105	C24
3107	C23
3108	D23
3110	D24
3112	D17
3113	D18
3115	D18
3117	D18
3118	E18
3120	C19
3121	C19
3123	D20
3125	F18
3127	F18
3128	E18
3130	G18
3131	G19
3133	E20
3135	E21
3136	E21
3137	E22
3139	F21
3140	F21
3142	F21
3143	F21
3145	F21
3147	F22
3150	E22
3152	E22
3153	E23
3155	F22
3157	F24
3158	F24
3162	H23
3164	H24
3165	H24
3168	I21
3170	I22
3171	I22
3172	I22
3182	H17
3185	J17
3187	I19
5006	B6
5055	A17
5057	B16
6006	B5
6007	C5
6028	H12
6029	H12
6030	I9
6035	J9
6043	I13
6049	J15
6050	J15
6060	A22
6061	A22
6092	F18
6093	E19
6095	G24
6110	I21
7002	A6
7003	B7
7004	C6
7005	C11
7006	C12
7007	F10
7010	B13
7020	E8
7023	E11
7025	E12
7027	I7
7028	H8
7030	J8
7035	I10
7040	I11
7050	E14
7055	A14
7058	B18
7060	B20
7067	C21
7070	D22
7080	D19
7080	C24
7090	
7092	
7095	
7100	
7110	
7120	


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A B C D E F G H I J
1509
PCB POWER SUPPLY PS
NETZTEIL/MAINS UNIT
+14/8VDM
+12VD
+14VDM
-30VD
+14/8VUM
+5VF
+30VD
+5VD
EC
RESET
+12VF
1510/13
1510/11
VS
AF
A
BA6161N
BLOCKING OSZILLATOR
DRIVE
7004
7002 BC369G
7003 BC848B
6006 RLS4148
6007 RLS4148
5006 1,5MH
11,9V
11,2V
PICTURE SEARCH
STROBE
DATA
OE
MIX.SYN
AUTO SEC
INSERT
MICRO
FMEM
MUTE
EN-FB
ATS
PRO-50
AV-2
AV-1
VP1
VP2
SDA
SCL
CLOCK
HI-S
V-SYNC
58
7020 HEF4094 SR1
7095/2
7095/15
7050/73
FE 7850/3 VS 7607/3
B
7028 BC848B
7027 BC848B
6030 BAS85
C
7030 BC858B
1510
1520
PCB DISPLAY CONTROL I DC (BEDIENEINHEIT I/KEYBOARD UNIT)
PCB DISPLAY CONTROL IIA DC (BEDIENEINHEIT II/KEYBOARD UNIT)
CAM->VTR
VTR->CAM
7050/2
7050/72
GND
AFC
6049
13
7005 BC848B
7006 BC848B
7007 BC858B
7023 BC848B
7025 BC848B
7035 BC848B
74HC373 7010
EPROM MOS 7055
7050 UPD78134
7040 SAA1310T
12MHZ 8382-249-597
1008
5055 6,8UH
14 12 15 16 17 18 19 20 21 22 10 5 6 7
TE
CTL
WT1
VS 4053/12
1526/1
1502/8
1502/6
1502/5
FE 4145
VS 2495
RLS4148
E
VP
7050/48
1520/4
1520/3
1510/3
+5VD

3 H12
9 H12
0 I9
5 J9
3 I13
9 J15

6050 J15
6060 A22
6061 A22
6092 F18
6093 E19
6095 G24

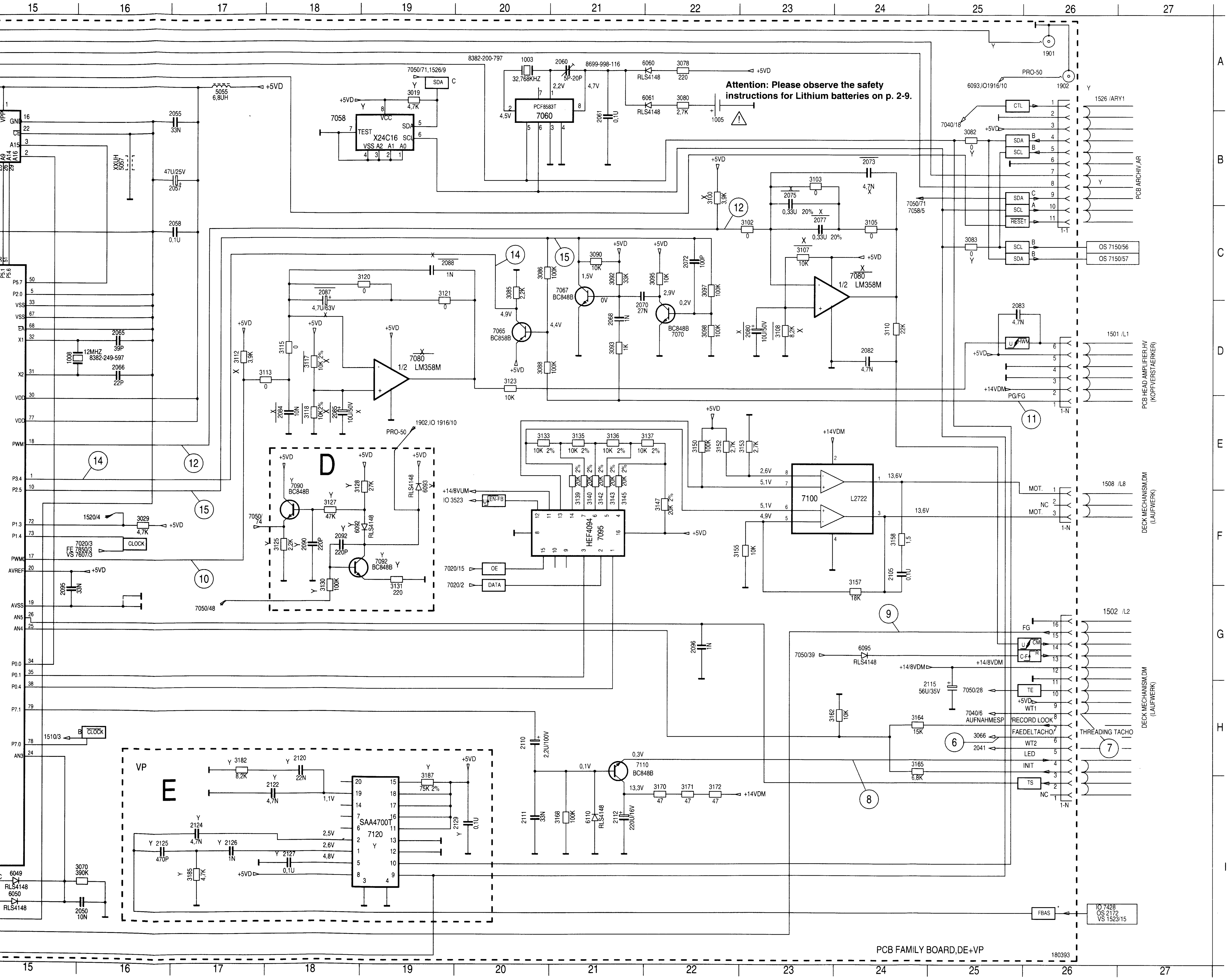
6110 I21
7002 A6
7003 B7
7004 C6
7005 C11
7006 C12

7007 F10
7010 B13
7020 E8
7023 E11
7025 E12
7027 I7

7028 H8
7030 J8
7035 I10
7040 I11
7050 E14
7055 A14

7058 B18
7060 B20
7067 C21
7070 D22
7080 D19
7080 C24

7090 E18
7092 F19
7095 F21
7100 F23
7110 H21
7120 I19


15
16
17
18
19
20
21
22
23
24
25
26
27
A
B
C
D
E
F
G
H
I
D
E
VP
X24C16
7058
PCF8583T
7060
32,768KHZ
1003
2060
5P-20P
1005
1901
1902
PRO-50
1/2 LM358M
7080
L2722
7100
HEF4094
7095
SAA4700T
7120
BC848B
7067
7070
7090
7092
7110
BC858B
7065
12MHZ
8382-249-597
8382-200-797
8699-998-116
1526 /ARY1
PCB ARCHIV.AR
1501 /L1
PCB HEAD AMPLIFIER.HV (KOPFVERSTAERKER)
1508 /L8
DECK MECHANISM.DM (LAUFWERK)
1502 /L2
MOT.
NC
FG
TE
WT1
RECORD LOOK
FAEDELTACHO
WT2
LED
INIT
TS
THREADING TACHO
OS 7150/56
OS 7150/57
IO 7428
OS 2172
VS 1523/15
FBAS
CTL
SDA
SCL
RESET
CLOCK
OE
DATA
EN-FB
+5VD
+14VDM
+14/8VUM
+14/8VDM
(6)
(7)
(8)
(9)
(10)
(11)
(12)
(14)
(15)

Attention: Please observe the safety instructions for Lithium batteries on p. 2-9.

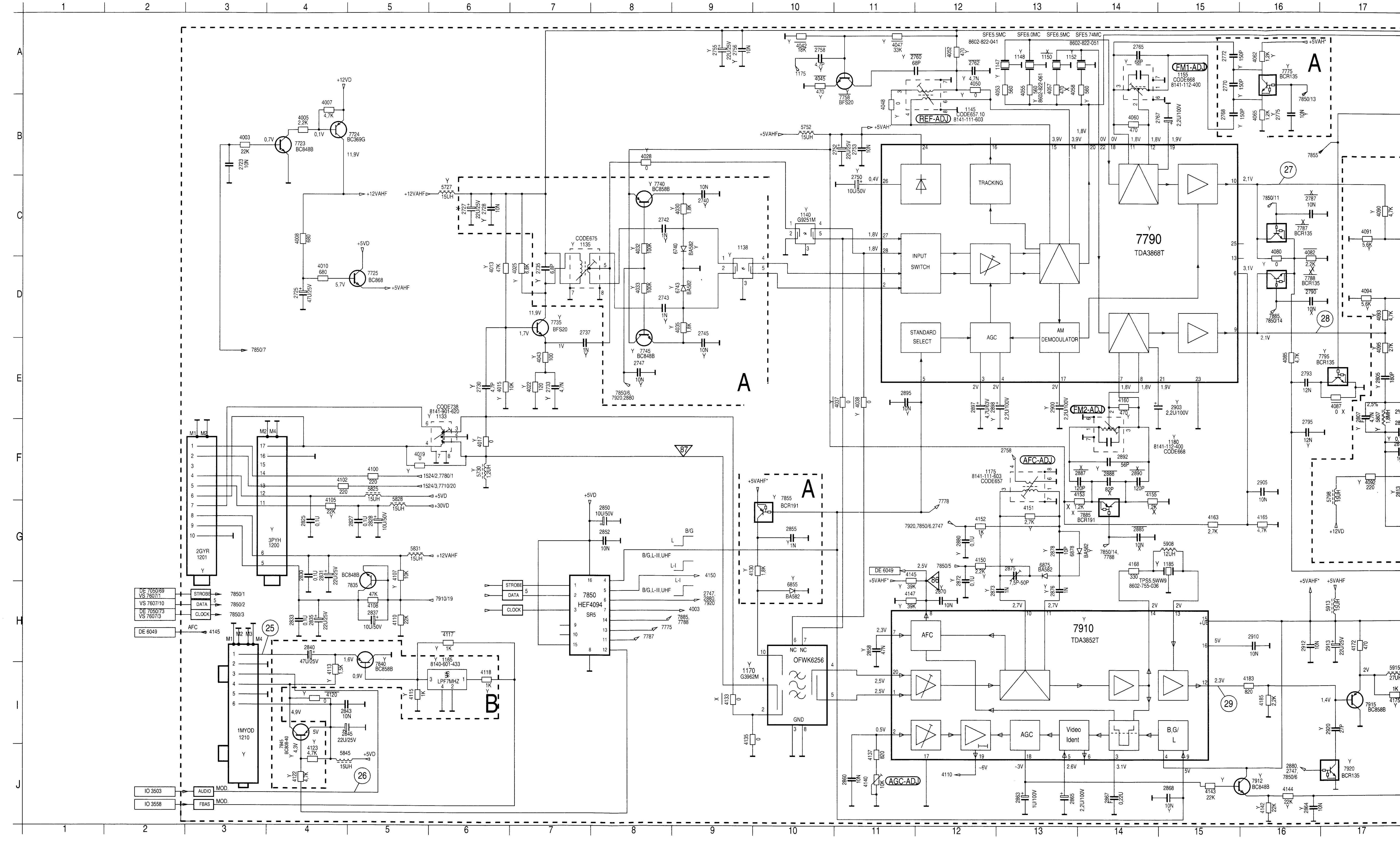
PCB FAMILY BOARD,DE+VP

180393

POS.-NR	FEATURES
A	DC CONVERTER
3011 1901	SAT CONTROL
B	TELETEXT-V7
C	DUBBING
D 1902	PRO 50
3082 3083	I^2C BUS TELETEXT
1526	ARCHIV
1520	SYNC EDIT
6029	WITH SQPB RLS4148 WITHOUT SQPB –
6028	WITH SQPB RLS4148 WITHOUT SQPB 0
3040	WITH SQPB RLS4148 WITHOUT SQPB 390K

Family Board – Frontend (FE)

1133 E6
1135 C7
1138 C9
1140 C10
1145 B12
1147 A13
1148 A13
1150 A13
1152 A13
1155 A15
1160 G20
1165 H6
1170 I9
1175 F12
1180 F15
1185 G15
1200 G4
1201 G3
1210 I3
1524 A23
1525 B23
2723 B3
2725 D4
2727 C6
2728 C6
2730 E6
2733 E7
2735 D7
2737 D7
2740 C9
2742 C8
2743 D8
2745 D9
2747 E8
2750 C11
2752 B11
2753 B11
2755 A9
2756 A9
2758 A10
2760 A12
2762 A12
2765 A14
2767 B15
2768 B15
2770 A15
2772 A15
2775 B16
2778 B19
2780 B19
2781 B20
2782 C20
2785 C18
2787 C16
2790 D16
2793 E16
2795 F16
2803 D18
2805 E17
2807 E17
2808 F17
2810 F18
2812 F17
2813 F17
2815 F18
2818 G18
2825 G4
2827 G5
2828 G5
2830 G4
2831 G4
2833 H4
2835 H4
2837 H5
2840 H4
2843 I4
2845 I5
2850 G8
2852 G8
2855 G10
2858 H11
2860 J11
2863 J13
2864 J16
2865 J13
2867 J14
2868 J15
2870 H12
2872 G12
2873 H12
2875 G13
2876 H13
2878 G13
2880 G12
2885 G14
2887 F14
2888 F14
2890 F14
2892 F14
2895 E11
2897 E12
2898 E12
2900 E13
2903 E15
2905 F16
2910 H16
2912 H16
2913 H17
2915 I18
2920 I17
4003 B3
4005 B4
4007 B4
4008 C4
4010 D4
4013 D6
4015 E6
4017 F6
4019 F5
4022 E7
4025 D7
4028 B8
4030 C9
4032 C8
4033 D8
4035 D9
4037 E11
4038 E11
4042 A10
4043 E7
4045 A10
4047 A11
4048 B11
4050 A12
4052 A12
4053 A13
4055 A13
4057 A13
4058 A13
4060 B14
4062 A16
4065 B16
4067 A18
4068 A18
4070 A19
4072 B20
4075 C21
4076 C21
4077 F21
4078 F22
4080 C16
4082 C16
4085 E16
4087 E17
4090 C17
4091 C17
4092 F17
4093 D17
4094 D17
4095 E17
4100 F5
4102 F4
4105 G4
4107 G5
4108 H5
4110 H5
4113 I4
4115 I5
4117 H6
4118 I6
4120 I4
4122 J4
4123 J4
4130 G9
4133 I9
4135 I9
4137 J11
4140 J11
4142 J16
4143 J15
4144 J16
4145 G11
4147 H11
4150 G12
4151 G13
4152 G12
4153 F14
4155 F14
4160 E14
4163 G15
4165 G16
4168 G14
4172 H17
4175 I17
4177 H18
4180 H18
4183 I16
4185 I16
5727 C6
5730 F6
5752 B10
5798 F17
5807 E17
5825 F5
5828 G5
5831 G5
5845 J4
5908 G15
5913 H17
5915 I17
6740 C9
6743 D9
6855 H10
6875 G13
6878 G13
7723 B4
7724 B5
7725 D5
7735 D7
7740 C8
7745 E8
7758 B11
7775 A16
7777 A18
7778 B19
7780 E20
7787 C16
7788 D16
7790 C14
7795 E17
7835 H5
7840 I5
7845 J4
7850 H7
7855 F10
7885 G14
7910 H14
7912 J16
7915 I17
7917 I18
7920 J17


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
A
B
C
D
E
F
G
H
I
J
7790
TDA3868T
TRACKING
INPUT SWITCH
STANDARD SELECT
AGC
AM DEMODULATOR
7910
TDA3852T
AFC
Video Ident
B,G/L
GND
OFWK6256
1170 G3962M
1140 G9251M
7850 HEF4094 SR5
STROBE
DATA
CLOCK
2GYR 1201
3PYH 1200
1MYOD 1210
LPF7MHZ
1165 8140-601-433
REF-ADJ
FM1-ADJ
FM2-ADJ
AFC-ADJ
AGC-ADJ
SFE5.5MC
SFE6.0MC
SFE6.5MC
SFE5.74MC
8602-822-041
8602-822-051
1155 CODE668 8141-112-400
1145 CODE657.10 8141-111-603
1175 8141-111-603 CODE657
1180 8141-112-400 CODE668
1185 TPS5.5WW9 8602-755-036
CODE675 1135
CODE738 8141-901-620 1133
7723 BC848B
7724 BC369G
7725 BC868
7735 BFS20
7740 BC858B
7745 BC848B
7758 BFS20
7775 BCR135
7787 BCR135
7788 BCR135
7795 BCR135
7835 BC848B
7840 BC858B
7855 BCR191
7885 BCR191
7912 BC848B
7915 BC858B
7920 BCR135
+12VD
+12VAHF
+5VD
+5VAHF
+30VD
+5VAH*
DE 7050/69 VS 7607/1
VS 7607/10
DE 7050/73 VS 7607/3
DE 6049
IO 3503
IO 3558
AUDIO
FBAS
MOD.
AFC
7850/1
7850/2
7850/3
7850/7
7850/13
7850/14
1524/2,7780/1
1524/3,7710/20
7910/19
7920,7850/6,2747
7850/6 7920,2880
B/G
B/G,L-III,UHF
L-I
25
26
27
28
29
87
B

CS 37430

6740 C9
6743 D9
6855 H10
6875 G13
6878 G13
7723 B4

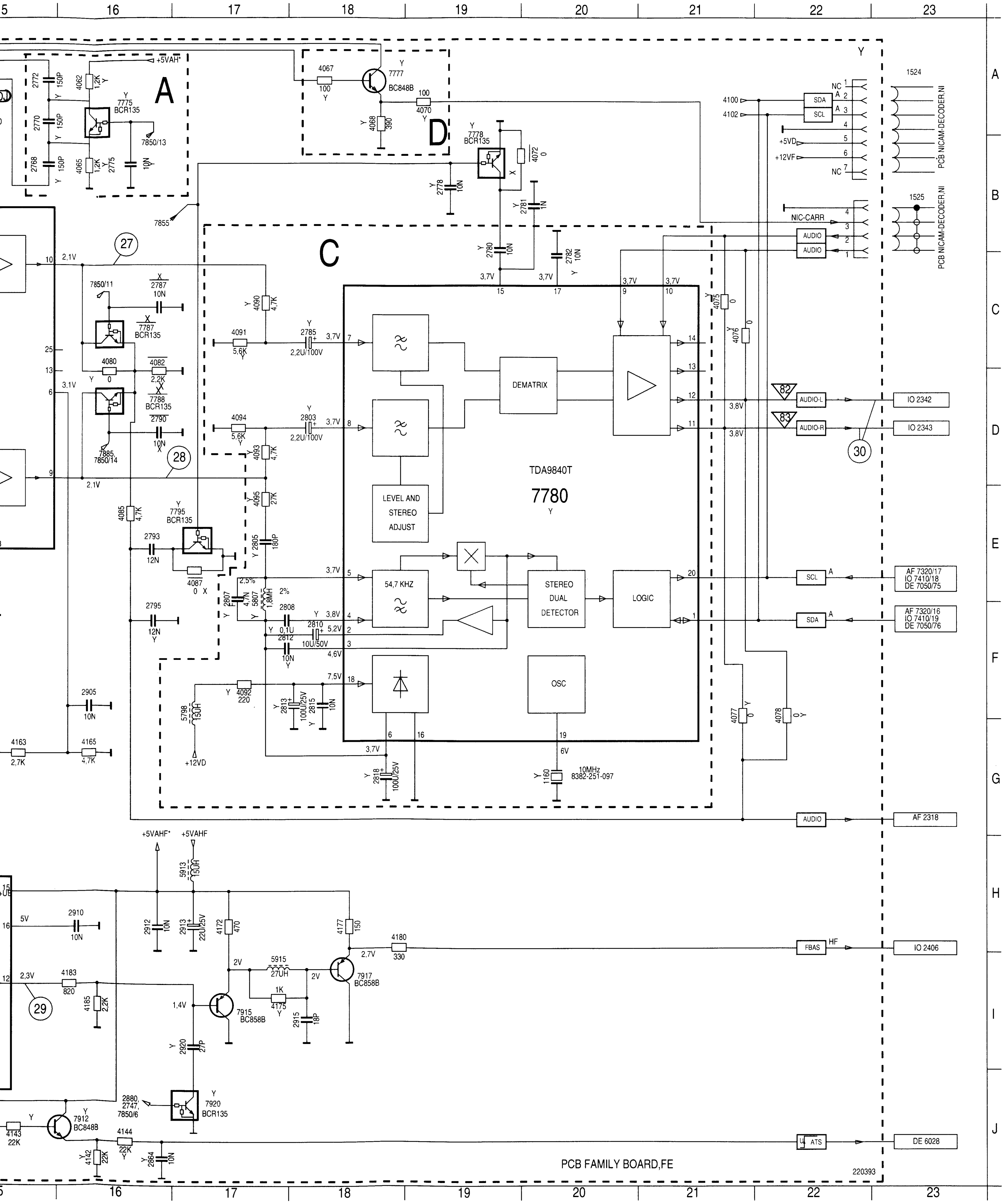
7724 B5
7725 D5
7735 D7
7740 C8
7745 E8
7758 B11

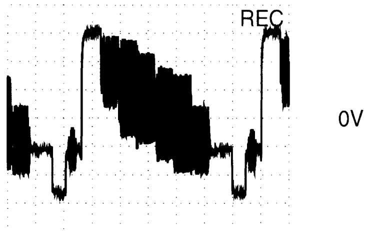
7775 A16
7777 A18
7778 B19
7780 E20
7787 C16
7788 D16

7790 C14
7795 E17
7835 H5
7840 I5
7845 J4
7850 H7

7855 F10
7885 G14
7910 H14
7912 J16
7915 I17
7917 I18

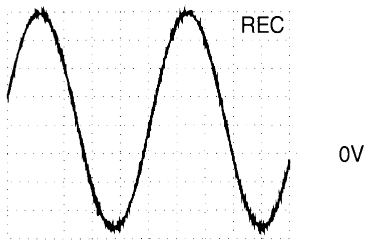
7920 J17


16
17
18
19
20
21
22
23
A
B
C
D
E
F
G
H
I
J
A
C
D
Y
+5VAH*
7775
BCR135
7850/13
7777
BC848B
4067
100
4070
4068
390
7778
BCR135
4072
2778
10N
2781
1N
2780
10N
2782
10N
7855
27
7850/11
2787
10N
7787
BCR135
4080
4082
2,2K
7788
BCR135
2790
10N
7885
7850/14
28
2,1V
3,1V
4090
4,7K
4091
5,6K
2785
2,2U/100V
4094
5,6K
2803
2,2U/100V
4093
4,7K
4095
27K
2805
180P
4085
4,7K
7795
BCR135
2793
12N
4087
2795
12N
2807
4,7N
5807
1,8MH
2808
2810
10U/50V
2812
0,1U
10N
2,5%
2%
3,7V
3,8V
5,2V
4,6V
7,5V
5798
150H
+12VD
4092
220
2813
100U/25V
2815
10N
2818
100U/25V
1160
10MHz
8382-251-097
6V
DEMATRIX
LEVEL AND
STEREO
ADJUST
TDA9840T
7780
54,7 KHZ
STEREO
DUAL
DETECTOR
LOGIC
OSC
4100
4102
SDA
SCL
+5VD
+12VF
NC
1524
PCB NICAM-DECODER.NI
1525
NIC-CARR
AUDIO
4075
4076
4077
4078
82
83
AUDIO-L
AUDIO-R
IO 2342
IO 2343
30
AF 7320/17
IO 7410/18
DE 7050/75
AF 7320/16
IO 7410/19
DE 7050/76
AF 2318
2905
10N
4163
2,7K
4165
4,7K
+5VAHF*
+5VAHF
5913
150H
2910
10N
5V
2912
10N
2913
220/25V
4172
470
4177
150
4180
330
FBAS
HF
IO 2406
2,7V
2V
5915
27UH
1K
4175
7917
BC858B
2,3V
4183
820
4185
22K
29
1,4V
7915
BC858B
2915
18P
2920
27P
2880
2747
7850/6
7920
BCR135
7912
BC848B
4143
22K
4144
22K
4142
2864
10N
ATS
DE 6028
PCB FAMILY BOARD,FE
220393



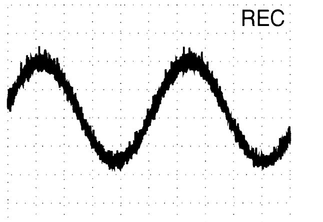
A: DC, 200mV/Div, 10us/Div
Modulator Pin 1

25



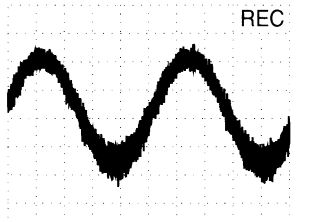
A: DC, 200mV/Div, 200us/Div
Modulator Pin 3

26



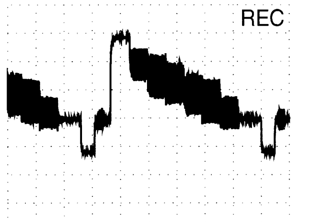
A: DC, 500mV/Div, 200us/Div
IC 7790 Pin 10

27



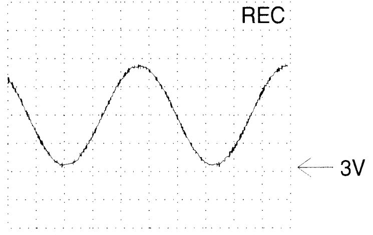
A: DC, 500mV/Div, 200us/Div
IC 7790 Pin 9

28



A: DC, 500mV/Div, 10us/Div
IC 7910 Pin 12

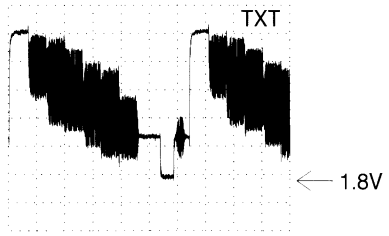
29



A: AC, 500mV/Div, 200us/Div
IC 7780 Pin 11/12

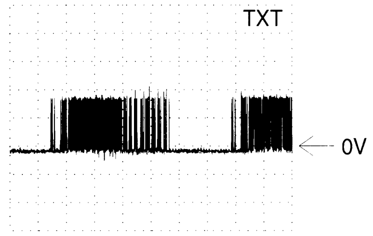
㉚

POS.-NR	PAL BG	PAL BG/I, SECAM BG/L	PAL I	PAL BG/NICAM
1MYOD	MDLK6D947A	MDLK6Z063A	MDLK6B947A	MDLK6D947A
3PYH	UV 916 E	UV 916 E	UV 916 E	UV 916 E
A 2733 2750 1148 4055 2895 2898 2900 4152 2880 4150 2872 6875 6878 2868 7920 2920 7795 2778 7778 2780	–	X	–	–
B	X	–	X	X
C 2903 4160 1180 2892 1152 4058	X	X	–	X
D	–	–	X	X
4025	O	6,8K	O	O
2737	X	–	X	X
4017 4019 5730	X	X	X	X
4105	22K	22K	22K	22K
4107	10K	10K	10K	10K
1140	G9251M	K9260M	K9260M	G9251M
1147	SFE5,5MC	SFE5,5MC	SFE6,0MB	SFE5,5MC
2765	68P	–	47P	68P
7790	TDA3867T	TDA3867T	TDA3867T	TDA3867T
1170	G3962M	K5260	G3963M	G3962M
2873 2876 2878	O	X	O	O
1185	TPS5,5MWA9	TPS5,5MWA9	TPS6,OMD9	TPS5,5MWA9
7910	TDA3853T	TDA3852T	TDA3853T	TDA3853T
4151	X	–	X	X
4175	1,5K	1K	1K	1,5K
4075 4076	–	–	X	–
1525	–	–	X	X
1524	–	–	X	X
2781	10N	1N	–	10N
2795	12N	1N	12N	12N
2793	–	X	–	–



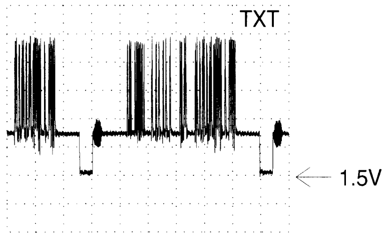
A: AC, 200mV/Div, 10us/Div
IC 7150 Pin 36

㉞



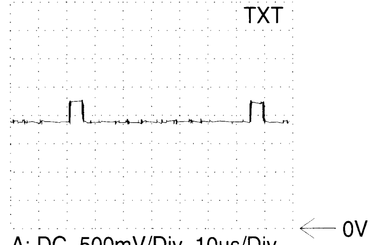
A: DC, 500mV/Div, 10us/Div
IC 7150 Pin 44/45/47

㉟



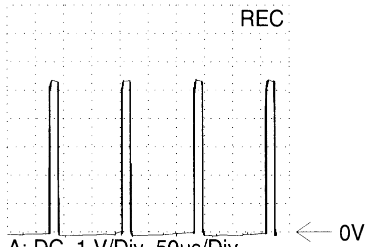
A: AC, 500mV/Div, 10us/Div
IC 7190 Pin 20

㊱



A: DC, 500mV/Div, 10us/Div
IC 7150 Pin 40

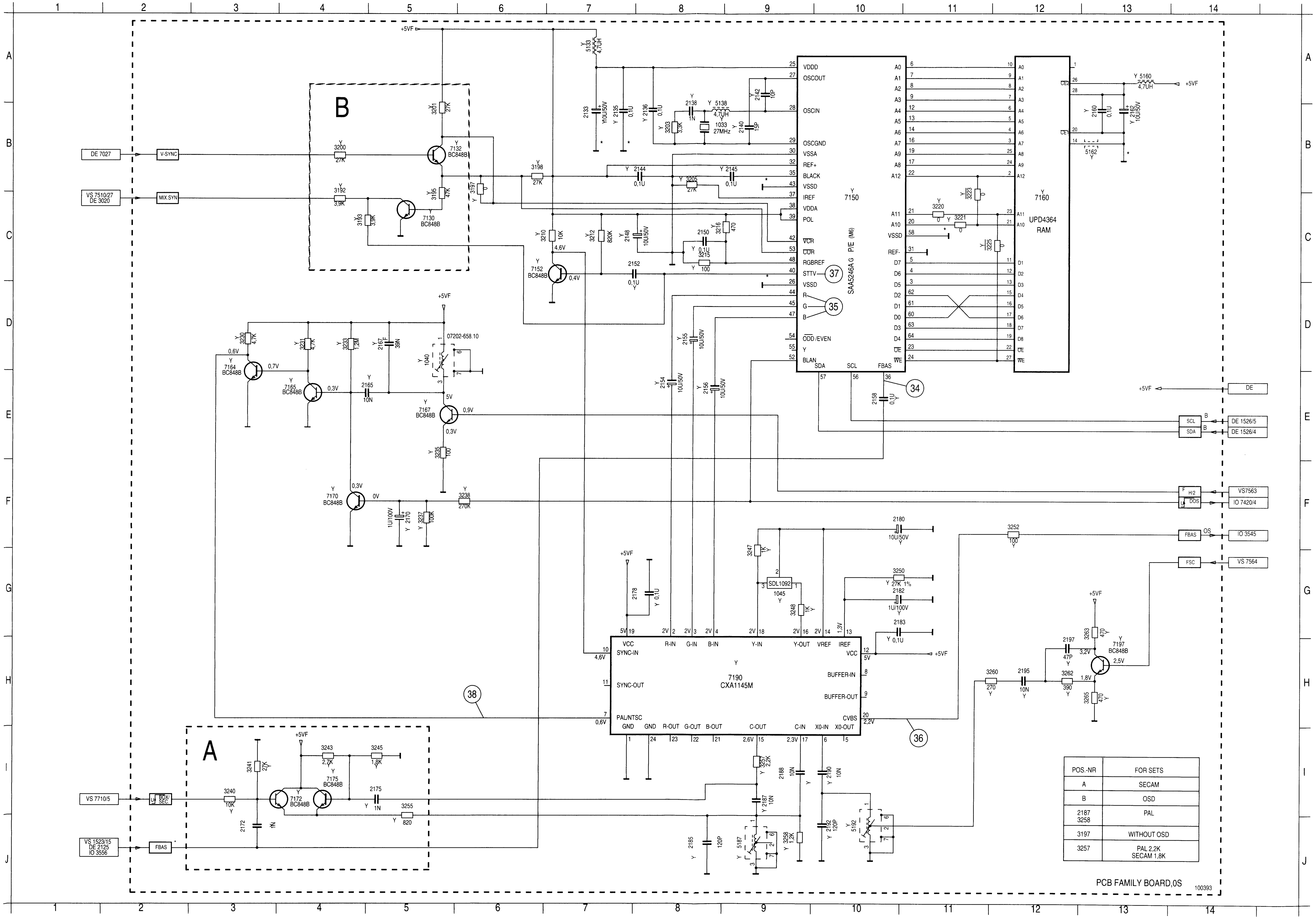
㊲



A: DC, 1 V/Div, 50us/Div
IC 7190 Pin 7

㊳

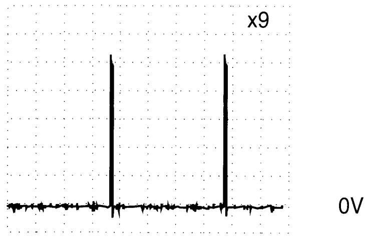
Family Board – Teletext "DOS" (OS)


A
B
DE 7027
V-SYNC
VS 7510/27 DE 3020
MIX.SYN
VS 7710/5
BDX/SEC
VS 1523/15 DE 2125 IO 3556
FBAS
+5VF
7132 BC848B
7130 BC848B
7152 BC848B
7164 BC848B
7165 BC848B
7167 BC848B
7170 BC848B
7172 BC848B
7175 BC848B
7197 BC848B
07202-658.10
7150 SAA5246A G P/E (M6)
7160 UPD4364 RAM
7190 CXA1145M
SDL1092 1045
1033 27MHz
VDDD
OSCOUT
OSCIN
OSCGND
VSSA
REF+
BLACK
VSSD
IREF
VDDA
POL
VCR
COR
RGBREF
STTV
R
G
B
ODD /EVEN
Y
BLAN
SDA
SCL
FBAS
VCC
SYNC-IN
SYNC-OUT
PAL/NTSC
R-IN
G-IN
B-IN
Y-IN
Y-OUT
VREF
IREF
BUFFER-IN
BUFFER-OUT
CVBS
GND
R-OUT
G-OUT
B-OUT
C-OUT
C-IN
X0-IN
X0-OUT
34
35
36
37
38
DE
DE 1526/5
DE 1526/4
SCL
SDA
H/2
DOS
VS7563
IO 7420/4
FBAS
OS
IO 3545
FSC
VS 7564
PCB FAMILY BOARD,0S
100393

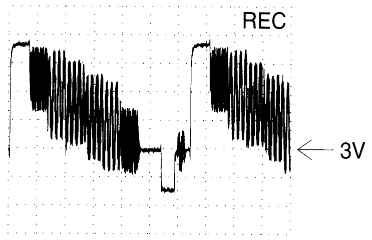
POS.-NR	FOR SETS
A	SECAM
B	OSD
2187 3258	PAL
3197	WITHOUT OSD
3257	PAL 2,2K SECAM 1,8K

1033	B8
1040	D5
1045	G9
2133	B7
2135	B7
2136	B8
2138	B8
2140	B9
2142	A9
2144	B8
2145	B9
2148	C7
2150	C8
2152	C7
2154	E8
2155	D8
2156	E8
2158	E10
2160	B13
2162	B13
2165	E5
2167	D5
2170	F5
2172	J3
2175	I5
2178	G8
2180	F10
2182	G10
2183	G10
2185	J8
2187	I9
2188	I9
2190	I10
2192	J10
2195	H12
2197	H12
3192	B4
3193	C4
3195	C5
3197	B6
3198	B6
3200	B4
3201	B5
3203	B8
3205	B8
3210	C6
3212	C7
3215	C8
3216	C8
3220	C11
3221	C11
3223	C11
3225	C11
3230	D3
3231	D4
3233	D4
3235	E5
3237	F5
3238	F6
3240	I3
3241	I3
3243	I4
3245	I5
3247	G9
3248	G9
3250	G10
3252	F12
3255	I5
3257	I9
3258	J9
3260	H12
3262	H12
3263	G13
3265	H13
5133	A7
5138	B8
5160	A13
5162	B13
5187	J9
5192	J10
7130	C5
7132	B5
7150	C10
7152	C6
7160	C12
7164	D3
7165	E4
7167	E5
7170	F4
7172	I4
7175	I4
7190	H9
7197	H13

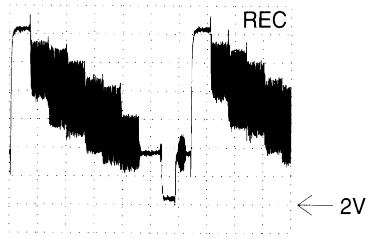
CS 37431



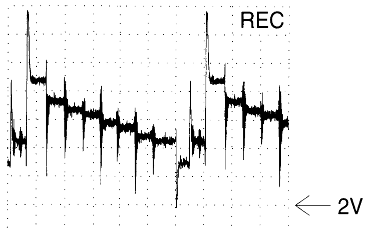
A: DC, 1 V/Div, 5ms/Div
IC 7050 Pin 15 V-EIN
16



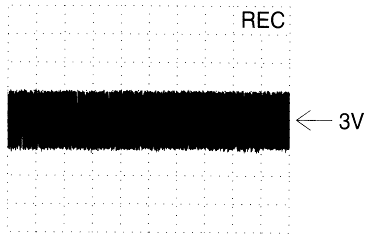
A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 33
㊴



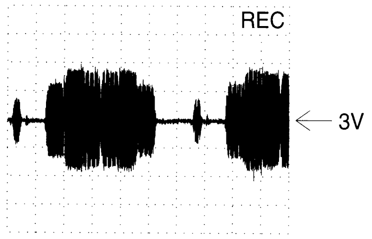
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 41
㊵



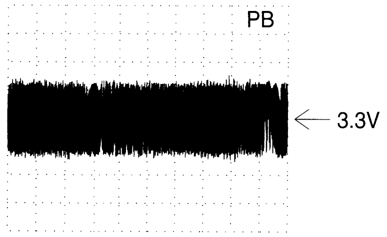
A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 43
㊷



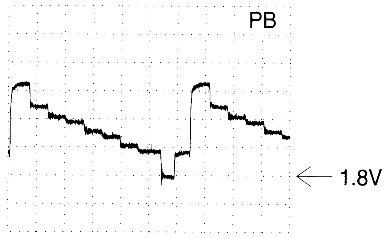
A: AC, 500mV/Div, 10us/Div
IC 7510 Pin 36
㊸



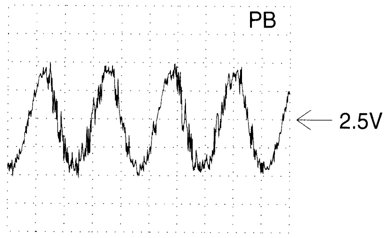
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 10
㊹



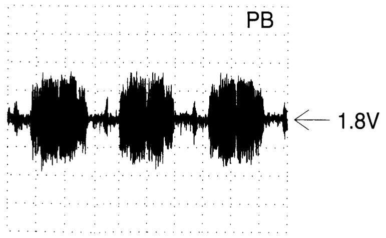
A: AC, 200mV/Div, 10us/Div
IC 7510 Pin 35
㊼



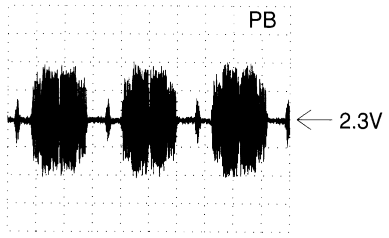
A: AC, 100mV/Div, 10us/Div
IC 7625 Pin 6
㊽



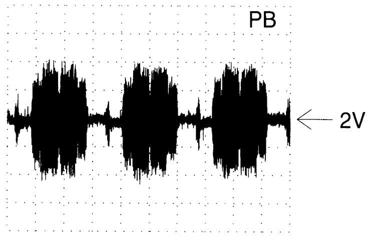
A: AC, 50mV/Div, 50ns/Div
IC 7625 Pin 7
㊾



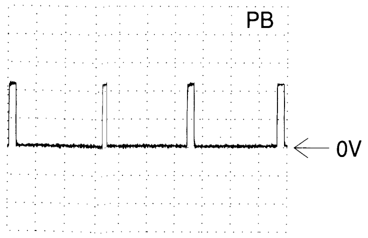
A: AC, 50mV/Div, 20us/Div
IC 7690 Pin 3
(53)



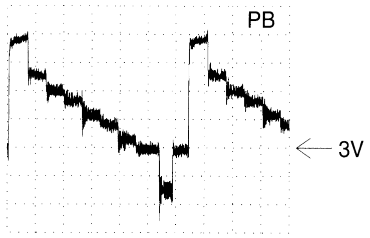
A: AC, 200mV/Div, 20us/Div
IC 7510 Pin 20
(54)



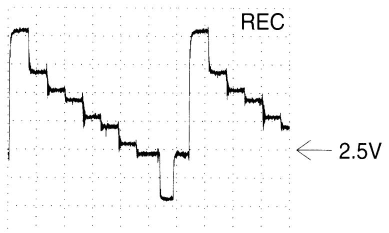
A: AC, 50mV/Div, 20us/Div
IC 7510 Pin 22
(55)



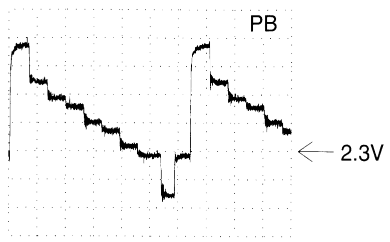
A: DC, 2 V/Div, 20us/Div
IC 7510 Pin 27
(58)



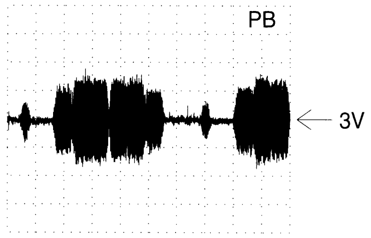
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 41
㊵



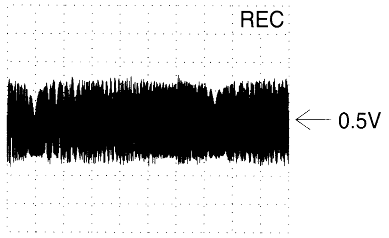
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 42
㊶



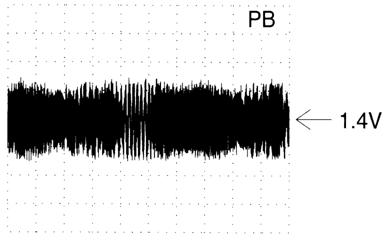
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 42
㊶



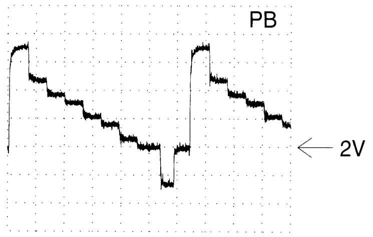
A: AC, 50mV/Div, 10us/Div
IC 7510 Pin 10
㊹



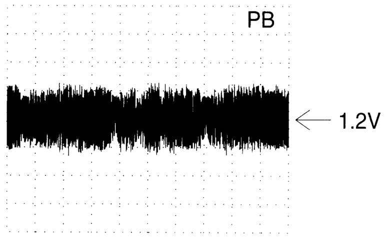
A: AC, 100mV/Div, 10us/Div
Connector 1526,2 FMZB
㊺



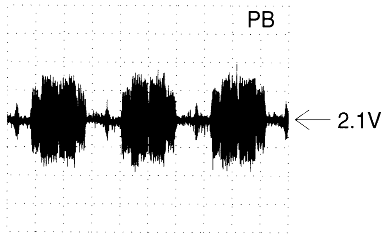
A: AC, 100mV/Div, 10us/Div
Connector 1526,9 Y-FM
㊻



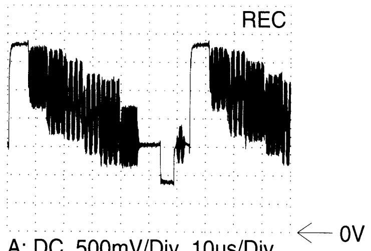
A: AC, 100mV/Div, 10us/Div
IC 7510 Pin 4
㊿



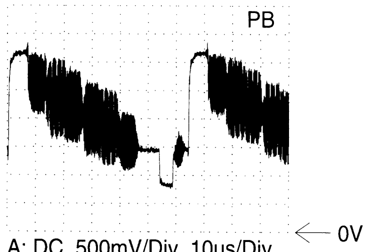
A: AC, 200mV/Div, 20us/Div
CONNECTOR 1526,11 FM-CH
(51)



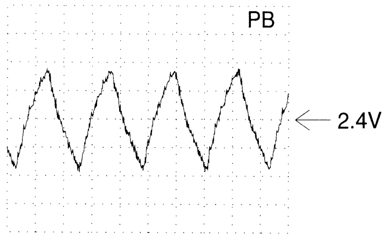
A: AC, 50mV/Div, 20us/Div
IC 7690 Pin 1
(52)



A: DC, 500mV/Div, 10us/Div
IC 7510 Pin 30
(56)



A: DC, 500mV/Div, 10us/Div
IC 7510 Pin 30
(56)

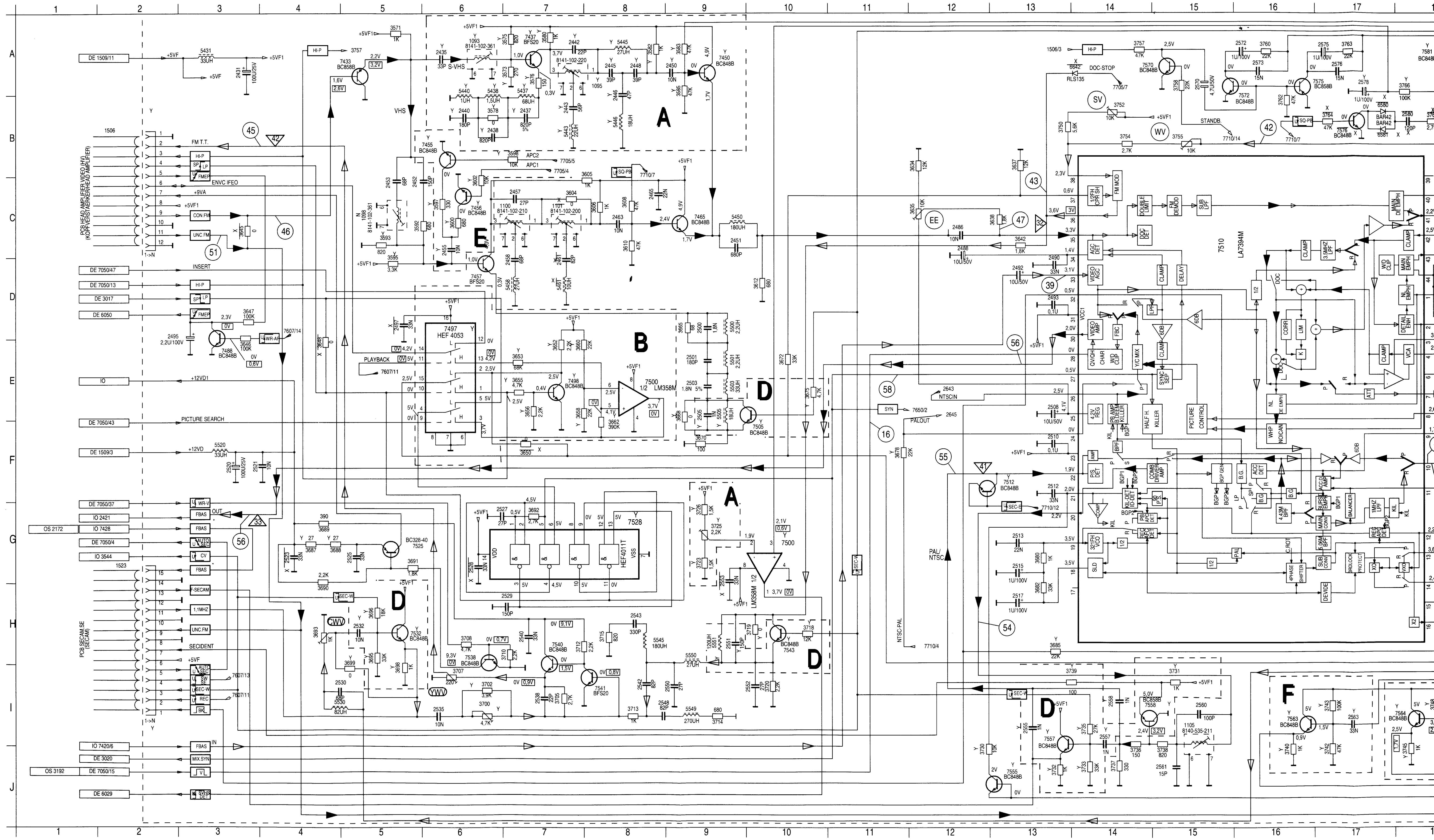


A: AC, 100mV/Div, 100ns/Div
IC 7690 Pin 5
(57)

Family Board – Video/Chroma (VS)

▷ **Record** ▶ **Playback**

1093 A6
1095 A8
1098 C5
1100 C7
1101 C7
1105 I15
1110 A22
1115 B23
1120 D22
1125 G19
1506 B2
1523 G2
2431 A3
2435 A6
2437 B7
2438 B6
2440 B6
2442 A7
2443 B7
2445 A8
2446 B8
2448 A8
2450 A9
2451 C9
2452 C5
2453 C5
2455 C6
2457 C7
2458 D7
2461 D7
2463 C8
2465 C8
2486 C12
2488 C12
2490 D13
2492 D13
2493 D13
2495 D2
2497 D5
2500 D9
2501 E9
2503 E9
2505 E9
2508 E13
2510 F13
2512 F13
2513 G13
2515 G13
2517 H13
2520 F3
2521 F3
2523 G4
2525 G5
2527 G6
2528 G6
2529 H7
2530 I5
2532 H5
2535 I6
2538 I7
2540 H7
2542 I8
2543 H8
2548 I8
2550 I9
2551 H9
2552 I10
2553 G9
2555 I13
2557 I14
2558 I14
2560 I15
2561 J15
2563 I17
2570 A15
2572 A16
2573 A16
2575 A17
2576 A17
2578 A17
2580 B18
2583 C19
2585 B19
2586 B19
2587 B20
2590 B21
2593 A22
2595 C22
2596 C21
2598 A24
2600 B24
2602 B24
2605 B25
2607 A27
2610 D18
2612 D19
2613 D19
2615 E19
2617 D19
2618 D18
2620 E19
2623 D21
2625 E20
2627 E21
2628 F21
2630 F21
2632 E21
2633 E22
2635 D23
2637 C23
2638 C24
2639 C24
2640 C25
2642 C25
2643 C26
2645 C27
2648 F24
2650 F24
2652 F25
2653 F25
2655 F26
2657 F27
2658 F27
2660 F18
2662 F18
2663 F18
2665 F18
2667 F19
2668 G19
2670 G19
2671 G18
2672 H18
2675 H19
2677 I19
2678 I20
2681 G21
2683 G22
2685 G22
2687 G23
2688 G23
2690 G24
2691 G24
2693 F24
2695 I21
2697 H21
2700 I22
2702 I22
2703 I21
2705 I21
2708 I24
2710 H27
3571 A5
3573 A7
3575 A7
3576 A7
3578 B6
3580 A7
3582 A8
3583 A9
3585 A9
3592 C5
3593 C5
3595 D5
3597 C6
3598 B7
3600 C6
3602 C6
3604 C7
3605 B8
3606 C8
3608 C8
3610 C8
3612 D10
3634 B12
3635 C12
3637 B13
3638 C13
3642 C13
3645 C3
3646 E3
3647 D3
3648 E4
3650 F7
3652 E7
3653 E7
3655 E7
3656 E7
3658 E7
3660 E7
3662 F8
3665 D9
3668 E9
3670 F9
3672 E10
3675 E10
3678 F11
3680 G13
3682 H13
3685 H13
3687 G4
3688 G4
3689 G4
3690 H4
3691 G5
3692 G7
3693 H4
3695 H5
3696 H5
3698 I5
3699 H5
3700 I6
3702 I6
3705 I7
3707 I6
3708 H6
3710 H7
3712 H7
3713 I8
3714 I9
3715 H8
3718 H10
3719 H10
3720 I10
3723 G9
3725 G9
3726 G9
3730 J12
3731 I15
3732 J13
3733 J14
3735 I14
3736 J14
3737 J14
3738 J15
3739 I14
3740 J16
3742 J17
3743 I17
3745 J18
3748 I18
3750 B13
3752 B14
3754 B14
3755 B15
3757 A14
3758 A15
3760 A16
3762 B16
3763 A17
3764 B17
3765 B18
3766 A18

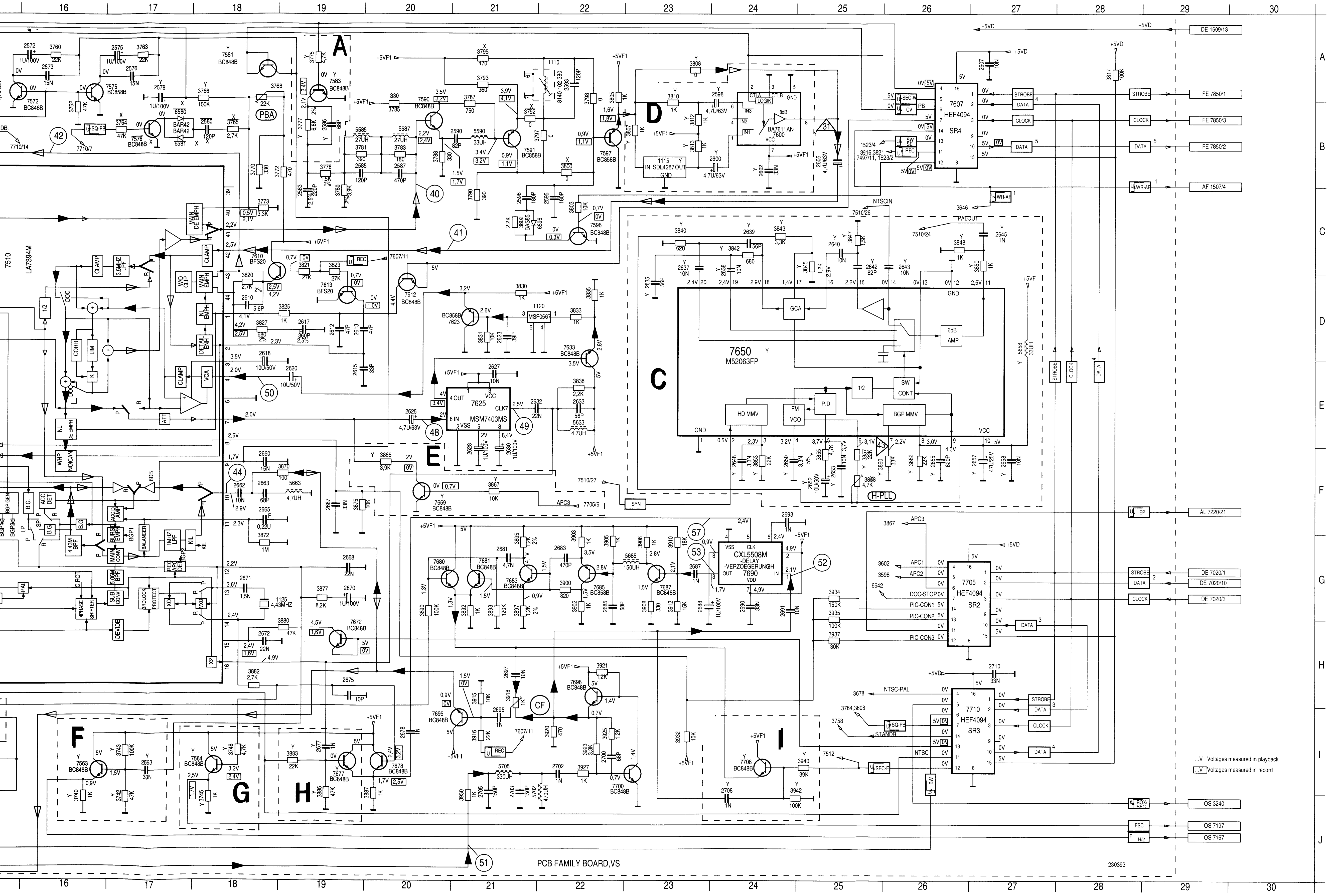

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
A
B
C
D
E
F
G
H
I
J
DE 1509/11
5431
33UH
+5VF
+5VF1
2431
100U25V
HI-P
3757
3571
1K
7433
BC858B
2,2V
3,2V
1,6V
2,8V
1093
8141-102-361
2435
33P
S-VHS
VHS
7437
BFS20
3575
820
3580
1K
2442
22P
5445
27UH
8141-102-220
2445
39P
2448
39P
2450
10N
7450
BC848B
4,9V
1,7V
5440
1UH
5438
1,5UH
5437
68UH
2440
180P
3578
2437
82P
2438
820P
2443
56P
5443
220UH
2446
47P
5446
18UH
A
1506
PCB HEAD AMPLIFIER VIDEO (HV)
(KOPFVERSTAERKERHEAD AMPLIFIER)
FM T.T.
45
42
HI-P
SP
LP
FMEP
ENVC IFEO
+9VA
+5VF1
CON FM
UNC FM
3645
46
51
1->N
7455
BC848B
3598
10K
APC2
APC1
7705/5
7705/4
3605
1K
SQ-PB
7710/7
+5VF1
7456
BC848B
3602
10K
2453
68P
2452
150P
1098
8141-102-361
3593
820
3595
3,3K
2457
27P
1100
8141-102-210
3604
1101
8141-102-200
3606
1K
3608
47K
2465
22N
2463
10N
3610
47K
2,4V
7465
BC848B
1,7V
5450
180UH
2451
680P
E
7457
BFS20
1,0V
2458
68P
5458
270H
5461
10UH
2461
82P
3612
680
DE 7050/47
INSERT
DE 7050/13
HI-P
DE 3017
SP
LP
DE 6050
FMEP
2,3V
3647
100K
2495
2,2U/100V
7488
BC848B
3646
100K
WR-AP
7607/14
IO
+12VD1
DE 7050/43
PICTURE SEARCH
DE 1509/3
+12VD
5520
33UH
2520
100U/25V
2521
10N
7497
HEF 4053
PLAYBACK
7607/11
3652
2,2K
3660
22K
3653
68K
3655
4,7K
7498
BC848B
3656
2,2K
3658
22K
3662
390K
3650
B
7500
1/2
LM358M
3665
68
2500
1,8N
5500
2,2UH
2501
180P
5501
2,2UH
2503
1,8N 5%
5503
33UH
2505
5505
18UH
7505
BC848B
3668
3670
100
D
3672
33K
3675
4,7K
DE 7050/37
WR-V
IO 2421
FBAS
OUT
OS 2172
IO 7428
FBAS
DE 7050/4
AUTO
IO 3544
CV
1523
FBAS
33
56
390
3689
3687
27
3688
27
2523
33N
2525
33N
BC328-40
7525
3691
1,8K
2,2K
3690
2527
27P
3692
2,7K
7528
HEF4011T
VDD
VSS
2528
33N
2529
150P
3726
1,5K
3725
2,2K
3723
1,5K
2553
33N
7500
LM358M
1/2
3,7V
1,9V
2,1V
0,6V
PCB SECAM SE
(SECAM)
F-SECAM
1.1MHZ
UNC.FM
SECIDENT
AUTO
SE
SW
SEC-W
REC
BK
7607/13
7607/11
SEC-W
3693
CWV
2532
10N
3696
18K
3695
33K
7532
BC848B
3698
1K
3699
2530
680P
5530
82UH
2535
10N
YWV
3707
220
3708
4,7K
7538
BC848B
3710
2,2K
3702
3,9K
3700
4,7K
2540
33N
7540
BC848B
2538
33N
3705
2,7K
3712
2,2K
7541
BFS20
3715
820
2543
330P
5545
180UH
2542
82P
2550
27P
5550
270H
2548
82P
5549
270UH
3713
1K
3714
680
5551
120UH
2551
150P
3719
7543
BC848B
3718
12K
2552
27P
2556
2,7K
DE 1509/11
IO 7420/6
FBAS
IN
DE 3020
MIX.SYN
OS 3192
DE 7050/15
DE 6029
SVHS
DET
1506/3
HI-P
6642
RLS135
DOC-STOP
7705/7
3757
47K
7570
BC848B
2,5V
3758
22K
2570
4,7U50V
SV
3752
10K
WV
3755
10K
3754
2,7K
STANDB.
7710/14
42
7710/7
2572
1U/100V
3760
22K
2573
15N
7572
BC848B
3762
47K
7575
BC858B
2575
1U/100V
3763
22K
2576
15N
2578
1U/100V
SQ-PB
3764
47K
7576
BC848B
6580
BAR42
6581
3766
100K
7581
BC848B
2580
120P
3750
5,6K
3634
12K
3637
12K
43
47
32
3635
10K
EE
3638
1,8K
2486
10N
3642
1,8K
2488
10U/50V
2490
33N
2492
10U/50V
39
2493
0,1U
56
+5VF1
58
2643
NTSCIN
SYN
7650/2
2645
PALOUT
16
3678
22K
55
41
7512
BC848B
2508
10U/50V
2510
0,1U
2512
33N
7710/12
SEC-E
PAL/
NTSC
2513
22N
3680
1K
2515
1U/100V
3682
33K
2517
1U/100V
54
NTSC-PAL
7710/4
3685
22K
7510
LA7394M
FM MOD
1/2FH CPR SH
DOUBLE LIMIT
FM DEMOD
SUB LPF
DOC DET
AGC DET
VIDEO AGC
CLAMP
DELAY
VIDEO AMP
FBC
LPF
CLAMP
6DB
QV/OH CHAR
WD CLP
Y/C MIX
SYNC SEP
12V REG
PB AMP DROPOUT KILLER
HALF H. KILLER
PICTURE CONTROL
BPF
AMP
PS DET
KIL DET ID DET
PB APC DET
REC APC DET
COMB DRIVER AMP
BGP GEN
1/2
1/2
FH VCO
SLD
PAL
B.G
ACC DET
ACC AMP
BURST EMPH
BALANCER
MAIN CONV
4.43M BPF
1MHZ LPF
KIL
SUB CONV
4PHASE SHIFTER
DEVIDE
SIDLOCK
PROTECT
XO
VXO
CLAMP
3.5MHZ LPF
MAIN DE EMPH
WD CLIP
MAIN EMPH
NL EMPH
DETAIL ENH
CORR
LIM
NL DE EMPH
WHP NOICAN
CLAMP
VCA
ATT
DOC
3739
100
3731
1K
+5VF1
SEC-V
D
2555
7557
BC848B
3735
27K
3732
1K
3733
33K
2557
1N
3736
150
3737
1K
2558
7558
BC858B
2,4V
3,2V
5,0V
3738
820
2561
15P
2560
100P
1105
8140-535-211
3730
10K
7555
BC848B
2V
0V
F
7563
BC848B
3743
100K
3740
1K
3742
47K
2563
33N
7564
BC848B
3745
1K

3712 H7	3720 I10	3732 J13	3739 I14	3750 B13	3760 A16	3768 A18	3778 B19	3788 B20	3798 A22
3713 I8	3723 G9	3733 J14	3740 J16	3752 B14	3762 B16	3770 B18	3780 C19	3790 C21	3800 B22
3714 I9	3725 G9	3735 I14	3742 J17	3754 B14	3763 A17	3772 B18	3781 B19	3792 B21	3802 C21
3715 H8	3726 G9	3736 J14	3743 I17	3755 B15	3764 B17	3773 C18	3783 B20	3793 A21	3803 C22
3718 H10	3730 J12	3737 J14	3745 J18	3757 A14	3765 B18	3775 A19	3785 B20	3795 A21	3805 A22
3719 H10	3731 I15	3738 J15	3748 I18	3758 A15	3766 A18	3777 B19	3787 A21	3797 B21	3807 B23

3808 A23	3821 C19	3833 D22	3845 C25	3857 F25	3870 F19	3883 I19	3895 G21	3906 G23	3918 H21
3810 A23	3823 C19	3835 D22	3847 C25	3858 F25	3872 G18	3885 I19	3897 G21	3908 G23	3920 I22
3812 B23	3825 D19	3838 E22	3848 C26	3860 F25	3875 F19	3887 I20	3900 G22	3910 G23	3921 H22
3813 B23	3827 D18	3840 C23	3850 C27	3862 F26	3877 G19	3890 G20	3902 G22	3912 G23	3923 I22
3817 A28	3830 D21	3842 C24	3853 F24	3865 F20	3880 H19	3892 G21	3903 G22	3915 H21	3925 I22
3820 D18	3831 D21	3843 C24	3855 F25	3867 F21	3882 H18	3893 G21	3905 G22	3916 I21	3927 I22

3930 J21	3942 I25	5445 A8	5501 E9	5549 I9	5633 E22	6580 B17	7450 A9	7497 D6
3932 I23	5431 A3	5446 B8	5503 E9	5550 H9	5658 D27	6581 B17	7455 B6	7498 E7
3934 G25	5437 A7	5450 C9	5505 E9	5551 H9	5663 F19	6596 C22	7456 C6	7500 G10
3935 G25	5438 A6	5458 D7	5520 F3	5585 B19	5685 G23	6642 A14	7457 D6	7500 E8
3937 H25	5440 A6	5461 D7	5530 I4	5587 B20	5702 I22	7433 A5	7465 C9	7505 F10
3940 I25	5443 B7	5500 D9	5545 H8	5590 B21	5705 I21	7437 A7	7488 E3	7510 C15

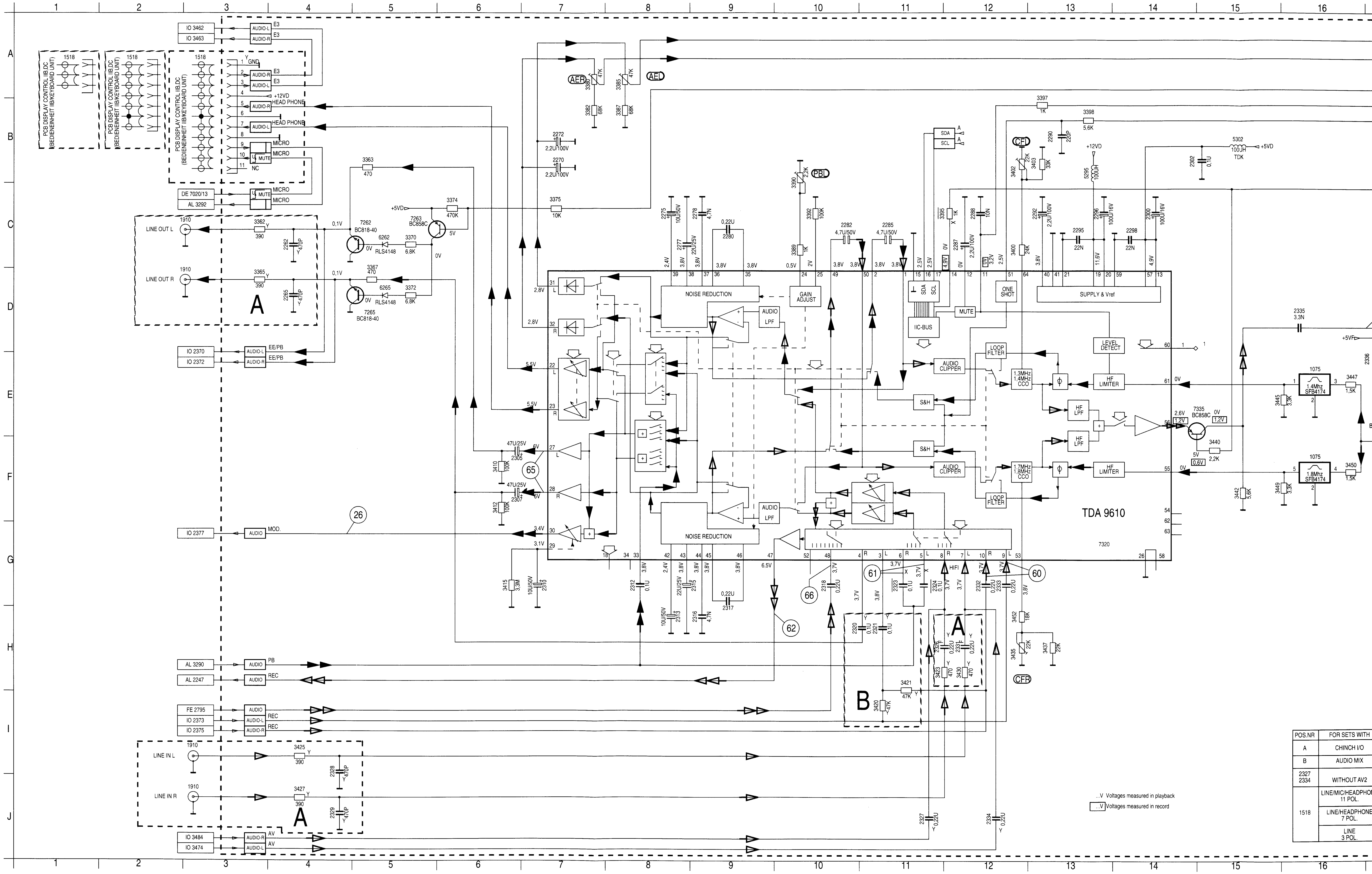
7512 F13	7541 I8	7564 I18	7583 A19	7607 B26	7633 D22	7680 G20	7695 I20
7525 G5	7543 H10	7570 A14	7590 A20	7610 C18	7650 D24	7681 G21	7698 H22
7528 G8	7555 J13	7572 B16	7591 B21	7612 D20	7659 F20	7683 G21	7700 I22
7532 H5	7557 I13	7575 A16	7596 C22	7613 D19	7672 H19	7685 G22	7705 G27
7538 H6	7558 I14	7576 B17	7597 B22	7623 D21	7677 I19	7687 G23	7708 I24
7540 H7	7563 I16	7581 A18	7600 B24	7625 E21	7678 I20	7690 G24	7710 I27


16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
A
B
C
D
E
F
G
H
I
J
7510
LA7394M
A
D
C
E
F
G
H
I
PBA
H-PLL
7650
M52063FP
GCA
6dB AMP
HD MMV
FM VCO
P.D
1/2
SW CONT
BGP MMV
7625
MSM7403MS
7600
BA7611AN
LOGIK
1115 SDL4287
7607
HEF4094
SR4
7705
HEF4094
SR2
7710
HEF4094
SR3
7690
CXL5508M
-DELAY
-VERZOEGERUNGH
1125
4,43MHZ
1120
MSF0567
1110
8140-102-380
MAIN DE EMPH
CLAMP
3.5MHZ LPF
W/D CLIP
MAIN EMPH
NL EMPH
DETAIL ENH
CORR
LIM
VCA
AT
DOC
NL DE EMPH
WHP
NOICAN
ACC DET
B.G
BURST EMPH
MAIN CONV
BALANCER
1MHZ LPF
KIL
4.43M BPF
5.06M BPF
SUB CONV
PROLOCK PROTECT
XO
4PHASE SHIFTER
DEVIDE
REC DET
C.ROT
X2
PAL
SQ-PB
REC
SEC-W
SEC-E
WR-AF
SVC
CV
PB
STROBE
DATA
CLOCK
EP
BOX/SEX
FSC
H/2
BW
NTSCIN
PALOUT
NTSC-PAL
STANDB
APC1
APC2
APC3
DOC-STOP
PIC-CON1
PIC-CON2
PIC-CON3
SYN
CF
+5VD
+5VF1
DE 1509/13
FE 7850/1
FE 7850/3
FE 7850/2
AF 1507/4
AL 7220/21
DE 7020/1
DE 7020/10
DE 7020/3
OS 3240
OS 7197
OS 7167
...V Voltages measured in playback
V Voltages measured in record
PCB FAMILY BOARD,VS
230393

POS.-NR	FEATURES
A 2578 3766	SVHS-PB
B 7528	4 VIDEO HEADS
C	NTSC/PAL
D 3700 7581 3739 1523	SECAM
E	STUDIO PICTURE CONTROL
3593	STUDIO PICTURE CONTROL 820
3795	STUDIO PICTURE CONTROL 3,3K
F	SUBTITEL RECORDING
G	TELETEXT
H 3678 3685	NTSC-PB
I 7512	SECAM EAST
2558 3668 3699 3702 3719 3808	WITHOUT SECAM WEST
7555 3730	BLACK/WHITE
3687	WITH FLY ERASE HEAD 27 WITHOUT FLY ERASE HEAD 47
3688	WITH FLY ERASE HEAD 27 WITHOUT FLY ERASE HEAD 47

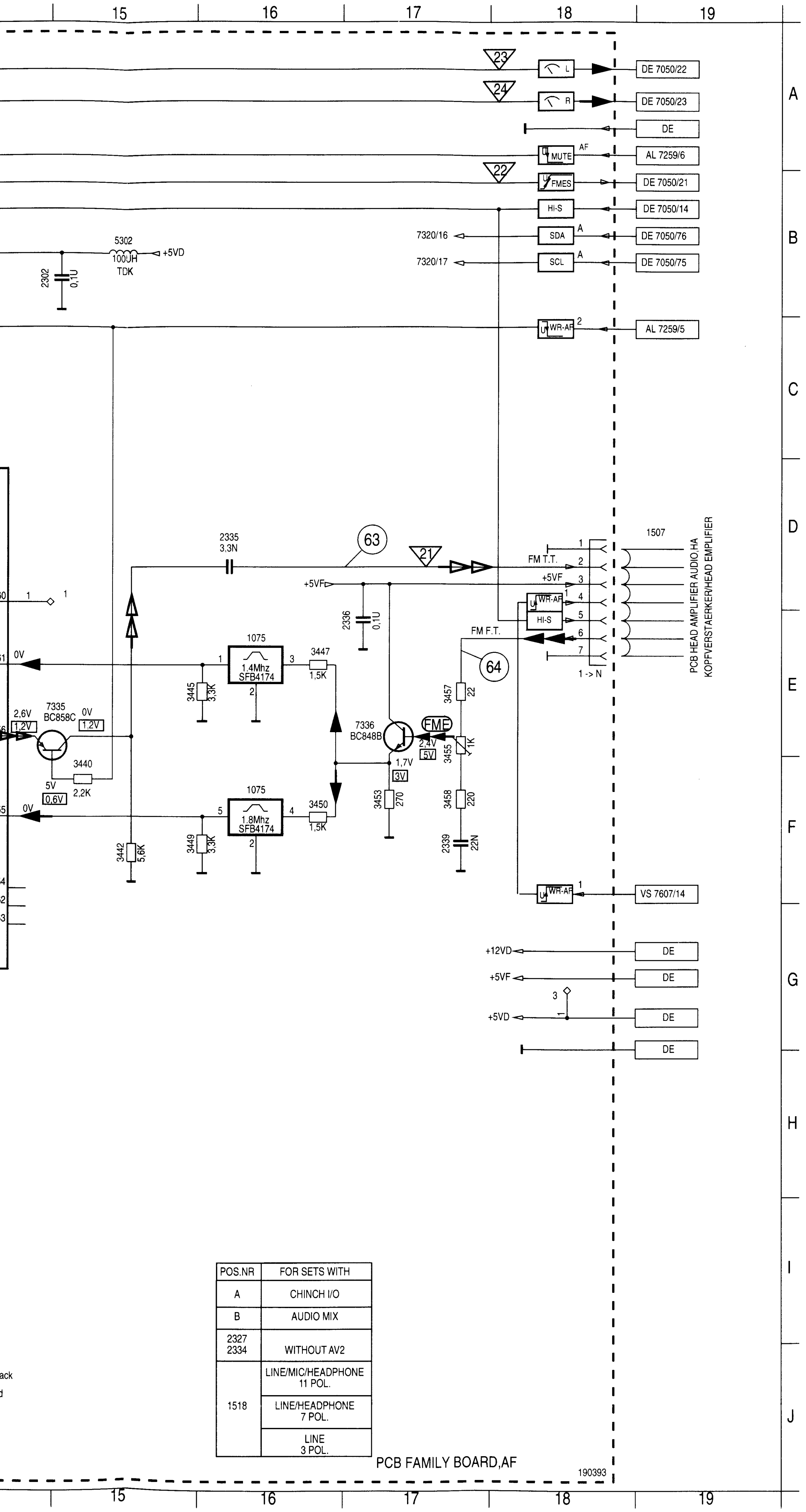
Family Board – FM-Sound (AF)

▷ Record "Left Channel"
–▷ Record "Right Channel"
▶ Playback "Left Channel"
–▶ Playback "Right Channel"


TDA 9610
7320
NOISE REDUCTION
NOISE REDUCTION
AUDIO LPF
GAIN ADJUST
IIC-BUS
SDA
SCL
MUTE
ONE SHOT
SUPPLY & Vref
LEVEL DETECT
LOOP FILTER
AUDIO CLIPPER
1,3MHz 1,4MHz CCO
1,7MHz 1,8MHz CCO
HF LIMITER
HF LPF
S&H
1075
1,4Mhz SFB4174
1,8Mhz SFB4174
7335 BC858C
7262 BC818-40
7263 BC858C
7265 BC818-40
6262 RLS4148
6265 RLS4148
LINE OUT L
LINE OUT R
LINE IN L
LINE IN R
1910
1518
PCB DISPLAY CONTROL IIB,DC (BEDIENEINHEIT IIB/KEYBOARD UNIT)
HEAD PHONE
MICRO
MUTE
NC
+12VD
+5VD
IO 3462
IO 3463
DE 7020/13
AL 3292
IO 2370
IO 2372
IO 2377
AL 3290
AL 2247
FE 2795
IO 2373
IO 2375
IO 3484
IO 3474
EE/PB
MOD.
PB
REC
AV
AER
AED
PBL
CFL
CFR
HIFI
A
B
26
60
61
62
65
66

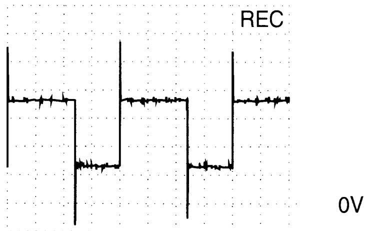
...V Voltages measured in playback
V Voltages measured in record

POS.NR	FOR SETS WITH
A	CHINCH I/O
B	AUDIO MIX
2327 2334	WITHOUT AV2
1518	LINE/MIC/HEADPHON 11 POL.
	LINE/HEADPHONE 7 POL.
	LINE 3 POL.


15
16
17
18
19
A
B
C
D
E
F
G
H
I
J
23
24
22
21
L
R
DE 7050/22
DE 7050/23
DE
MUTE
AF
AL 7259/6
FMES
DE 7050/21
HI-S
DE 7050/14
SDA
A
DE 7050/76
SCL
DE 7050/75
7320/16
7320/17
5302
100UH
TDK
+5VD
2302
0,1U
WR-AF
2
AL 7259/5
2335
3,3N
63
64
+5VF
FM T.T.
FM F.T.
2336
0,1U
1507
1 -> N
PCB HEAD AMPLIFIER AUDIO,HA
KOPFVERSTAERKER/HEAD EMPLIFIER
1075
1.4Mhz
SFB4174
1.8Mhz
SFB4174
3447
1,5K
3450
1,5K
3445
3,3K
3449
3,3K
3442
5,6K
7335
BC858C
2,6V
1,2V
0V
5V
0,6V
3440
2,2K
7336
BC848B
FMF
2,4V
5V
1,7V
3V
3453
270
3455
1K
3457
22
3458
220
2339
22N
VS 7607/14
+12VD
DE
3
PCB FAMILY BOARD,AF
190393

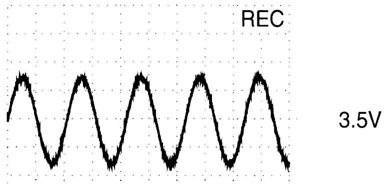
POS.NR	FOR SETS WITH
A	CHINCH I/O
B	AUDIO MIX
2327 2334	WITHOUT AV2
1518	LINE/MIC/HEADPHONE 11 POL.
	LINE/HEADPHONE 7 POL.
	LINE 3 POL.

1	D15
1075	E16
1075	F16
1507	D19
1518	A3
1910	C3
1910	J3
1910	I3
1910	D3
2262	C4
2265	D4
2270	B7
2272	B7
2275	C8
2277	C8
2278	C9
2280	C9
2282	C10
2285	C11
2287	C12
2288	C12
2290	B13
2292	C13
2295	C13
2296	C13
2298	C14
2300	C14
2302	B14
2305	F6
2307	F6
2310	G7
2312	G8
2313	H8
2315	G9
2316	H9
2317	H9
2318	G10
2320	H10
2321	H11
2323	G11
2324	G11
2326	H11
2327	J11
2328	I4
2329	J4
2331	H12
2332	G12
2333	G12
2334	J12
2335	D16
2336	E17
2339	F17
3	G18
3362	C3
3363	B5
3365	D3
3367	D5
3370	C5
3372	D5
3374	C6
3375	C7
3380	A7
3382	B7
3385	A8
3387	B8
3389	C10
3390	C10
3392	C10
3395	C11
3397	B13
3398	B13
3400	C12
3402	B12
3403	B13
3410	F6
3412	F6
3415	G6
3420	I11
3421	H11
3423	H11
3425	I4
3427	J4
3430	H12
3435	H12
3437	H13
3440	F15
3442	F15
3445	E15
3447	E16
3449	F15
3450	F16
3452	H12
3453	F17
3455	E17
3457	E17
3458	F17
5295	B13
5302	B15
6262	C5
6265	D5
7262	C5
7263	C5
7265	D5
7320	G13
7335	E15
7336	E17



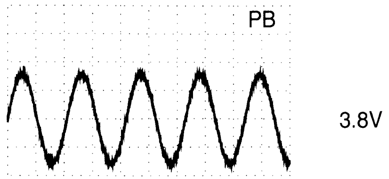
A: DC, 1 V/Div, 10ms/Div
Connector 1503, 7 CTL

13



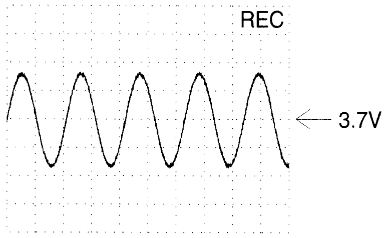
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 30

26



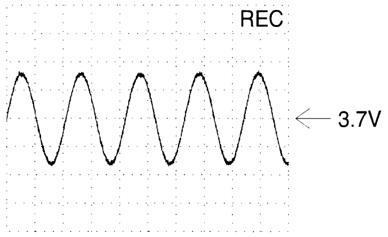
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 30

26



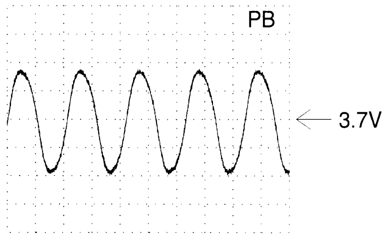
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 9

(60)



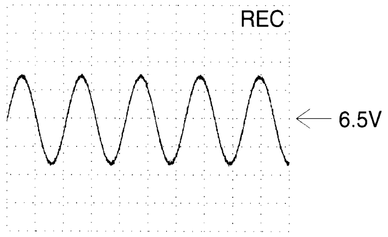
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 5

(61)



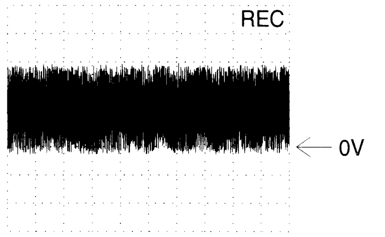
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 5

(61)



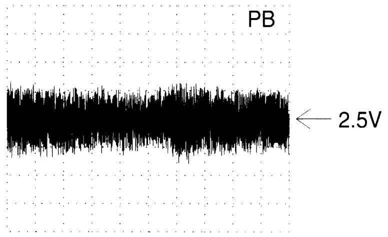
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 47

(62)



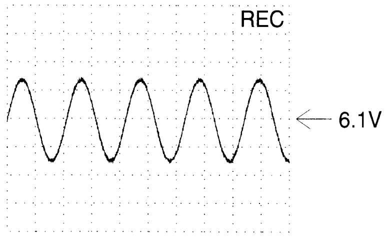
A: DC, 200mV/Div, 10us/Div
Connector 1507 Pin 2

(63)



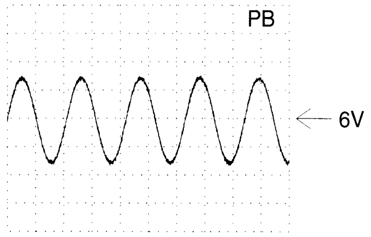
A: AC, 200mV/Div, 10us/Div
Connector 1507 Pin 6

(64)



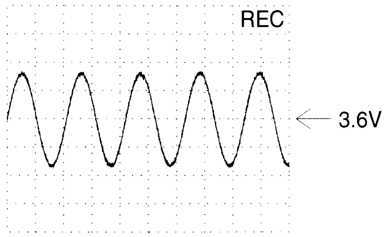
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 27

(65)



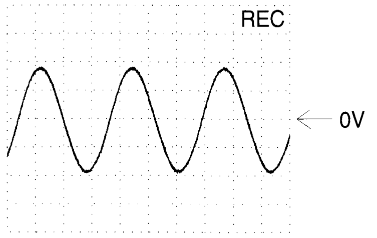
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 27

(65)



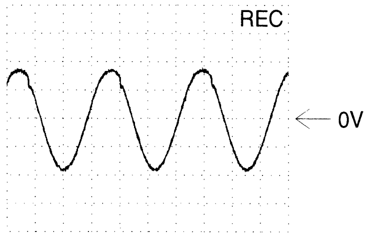
A: AC, 500mV/Div, 500us/Div
IC 7320 Pin 48

(66)



A: AC, 20 V/Div, 5us/Div
Connector 1503 Pin 1

(67)

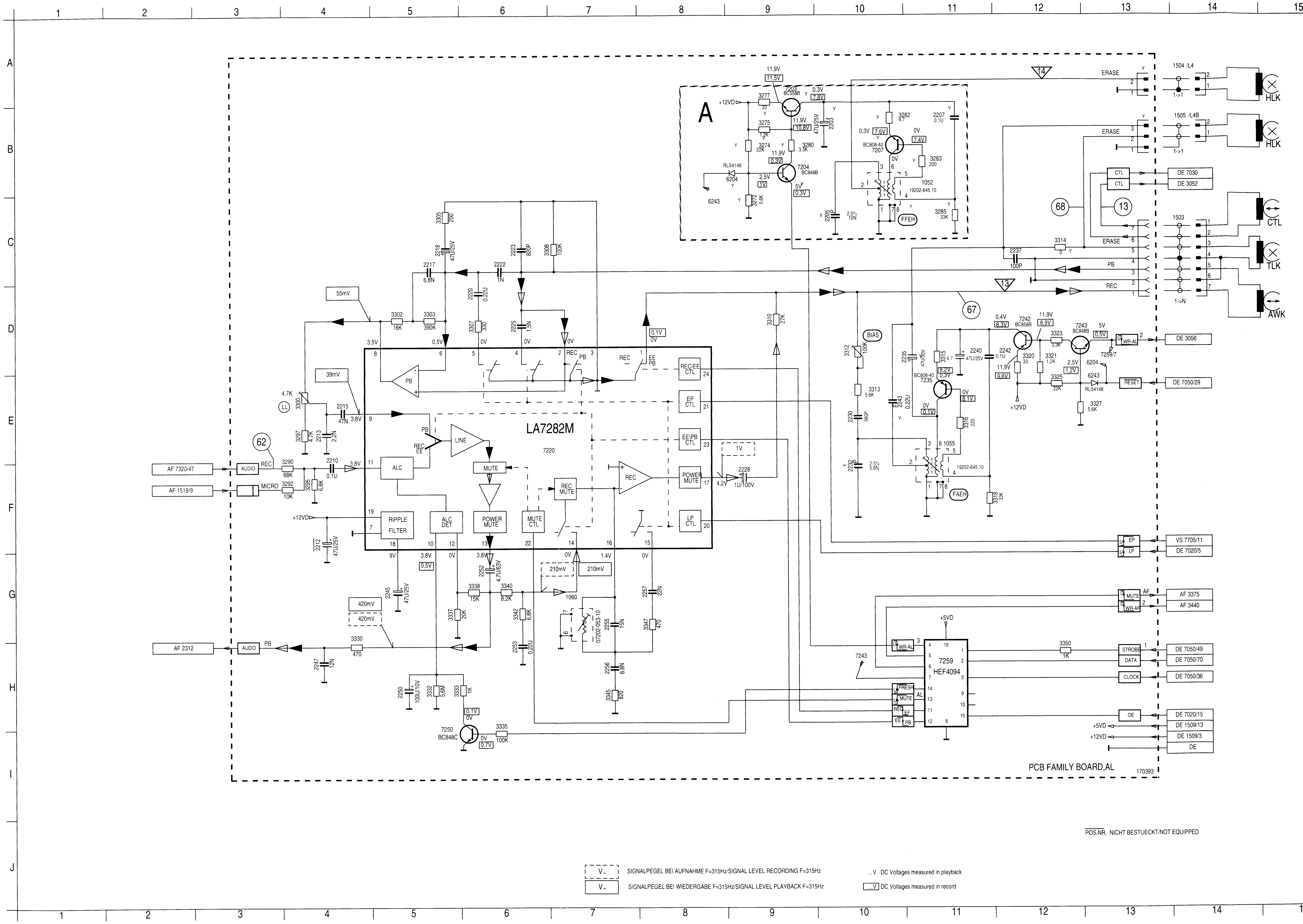


A: AC, 5 V/Div, 5us/Div
Connector 1503 Pin 5

(68)

Family Board – Standard Sound / Audio Linear (AL)

▷ Record ► Playback


LA7282M
7220
PB
LINE
ALC
MUTE
REC
REC MUTE
POWER MUTE
MUTE CTL
RIPPLE FILTER
ALC DET
REC/EE CTL
EP CTL
EE/PB CTL
LP CTL
A
BIAS
FFEH
FAEH
7259
HEF4094
AF 7320/47
AF 1518/9
AF 2312
AUDIO
MICRO
REC
PB
55mV
39mV
420mV
210mV
1V
62
67
68
13
14
ERASE
CTL
STROBE
DATA
CLOCK
OE
RESET
WR-AL
WR-AF
FRESH
EP
LP
1504 /L4
1505 /L4B
1503
HLK
CTL
TLK
AWK
DE 7030
DE 3052
DE 3056
DE 7050/29
VS 7705/11
DE 7020/5
AF 3375
AF 3440
DE 7050/49
DE 7050/70
DE 7050/36
DE 7020/15
DE 1509/13
DE 1509/3
DE
+5VD
+12VD
7203 BC558B
7204 BC848B
7207 BC808-40
7235 BC808-40
7242 BC858B
7243 BC848B
7250 BC848C
1052 19202-645.10
1055 19202-645.10
1060 07202-653-10
RLS4148
PCB FAMILY BOARD,AL
170393

POS.NR. NICHT BESTUECKT/NOT EQUIPPED

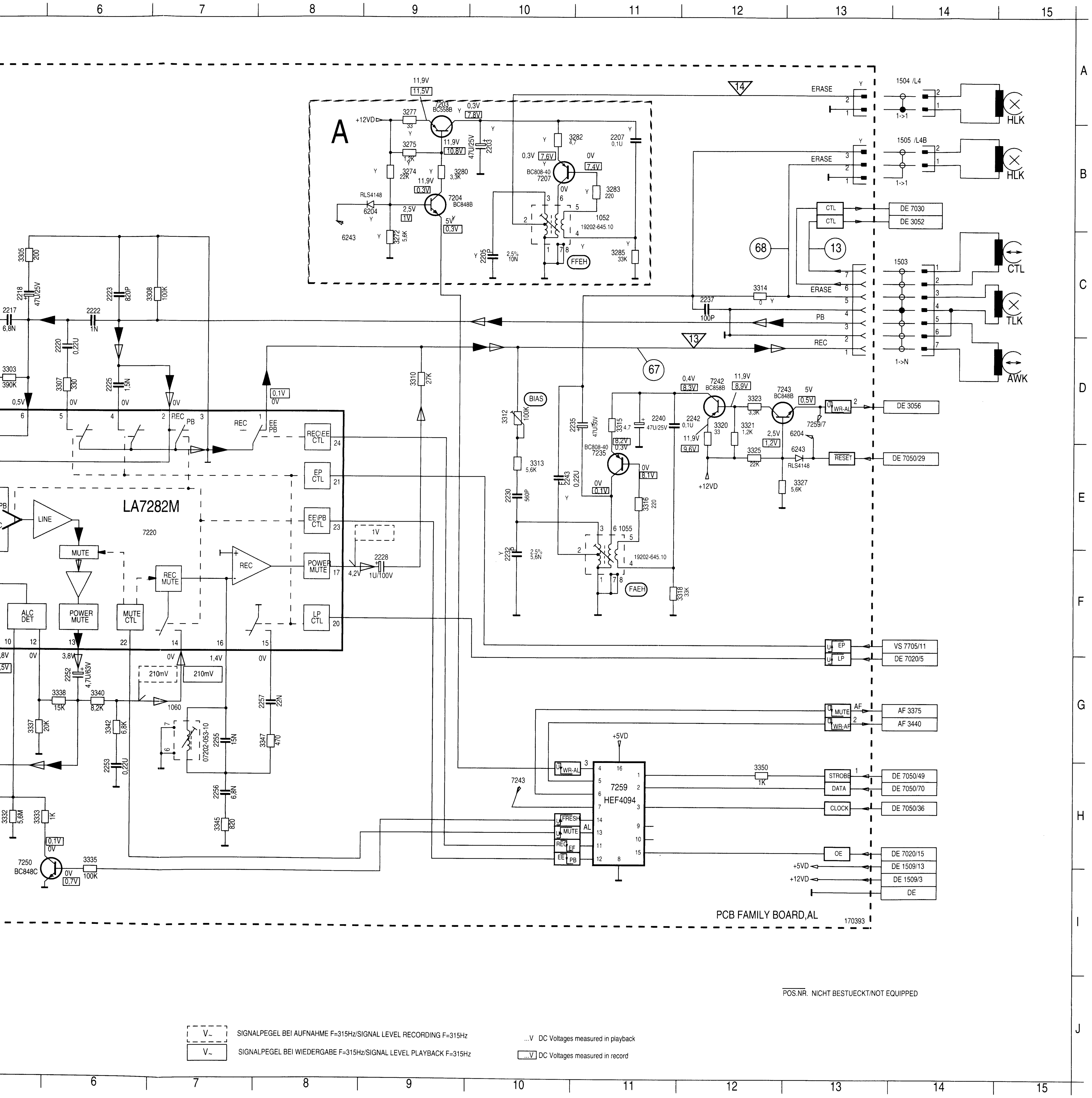
V~ SIGNALPEGEL BEI AUFNAHME F=315Hz/SIGNAL LEVEL RECORDING F=315Hz

V~ SIGNALPEGEL BEI WIEDERGABE F=315Hz/SIGNAL LEVEL PLAYBACK F=315Hz

...V DC Voltages measured in playback

...V DC Voltages measured in record

▷ **Record** ► **Playback**


A
+12VD
7203 BC558B
7204 BC848B
7207 BC808-40
1052 19202-645.10
FFEH
6243
6204 RLS4148
ERASE
PB
REC
1504 /L4
1505 /L4B
1503
HLK
CTL
TLK
AWK
DE 7030
DE 3052
68
13
14
67
BIAS
7235 BC808-40
7242 BC858B
7243 BC848B
1055 19202-645.10
FAEH
WR-AL
RESET
DE 3056
DE 7050/29
+12VD
LA7282M
7220
LINE
MUTE
POWER MUTE
ALC DET
MUTE CTL
REC MUTE
REC
REC/EE CTL
EP CTL
EE/PB CTL
POWER MUTE
LP CTL
1060
07202-053-10
7250 BC848C
210mV
EP
LP
VS 7705/11
DE 7020/5
AF
MUTE
WR-AF
AF 3375
AF 3440
+5VD
7259 HEF4094
7243
STROBE
DATA
CLOCK
OE
FRESH
EE
PB
AL
DE 7050/49
DE 7050/70
DE 7050/36
DE 7020/15
DE 1509/13
DE 1509/3
DE
+5VD
+12VD
PCB FAMILY BOARD,AL
170393
6
7
8
9
10
11
12
13
14
15
A
B
C
D
E
F
G
H
I
J

POS.NR. NICHT BESTUECKT/NOT EQUIPPED

[V~] SIGNALPEGEL BEI AUFNAHME F=315Hz/SIGNAL LEVEL RECORDING F=315Hz

V~ SIGNALPEGEL BEI WIEDERGABE F=315Hz/SIGNAL LEVEL PLAYBACK F=315Hz

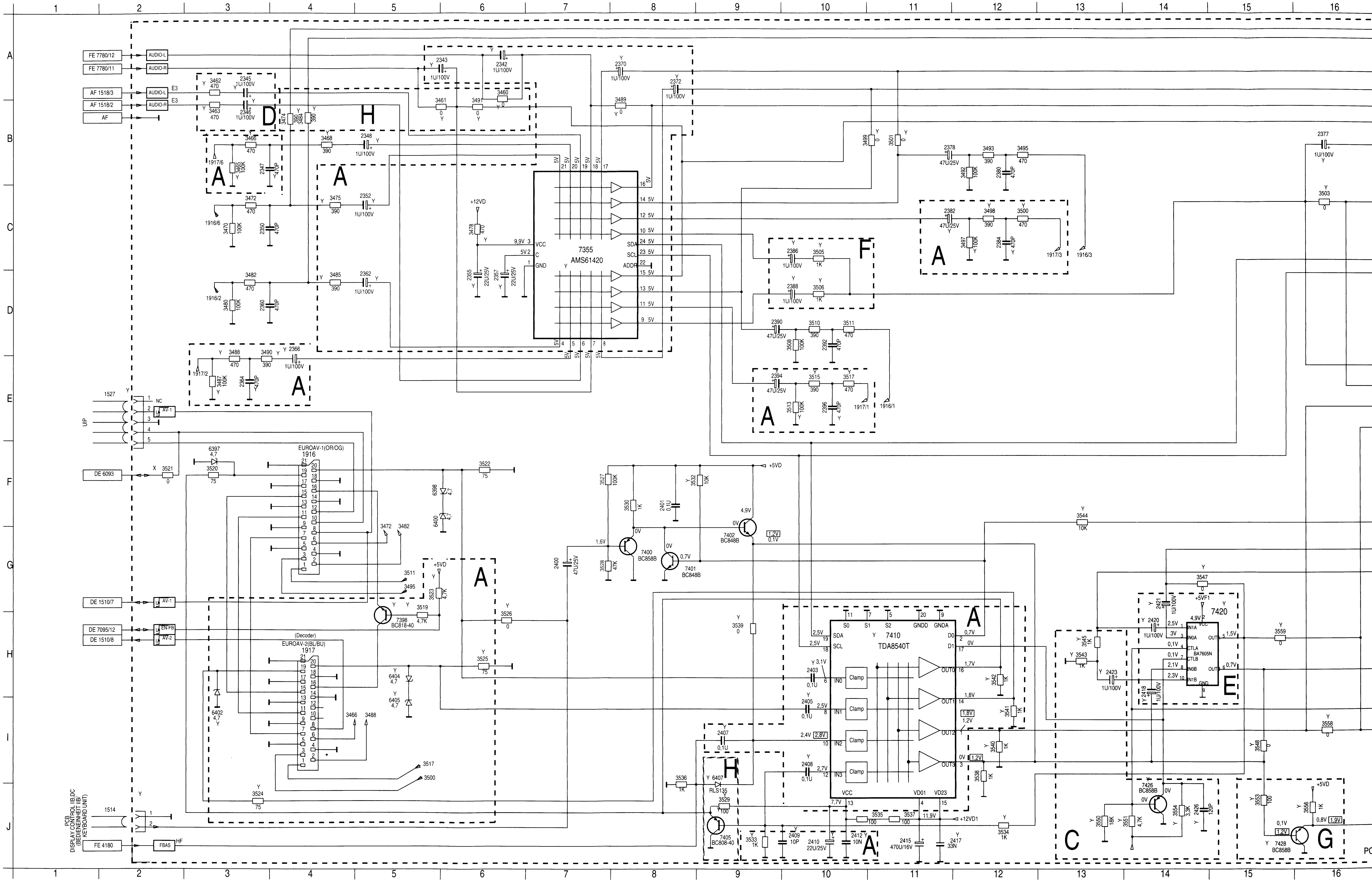
...V DC Voltages measured in playback

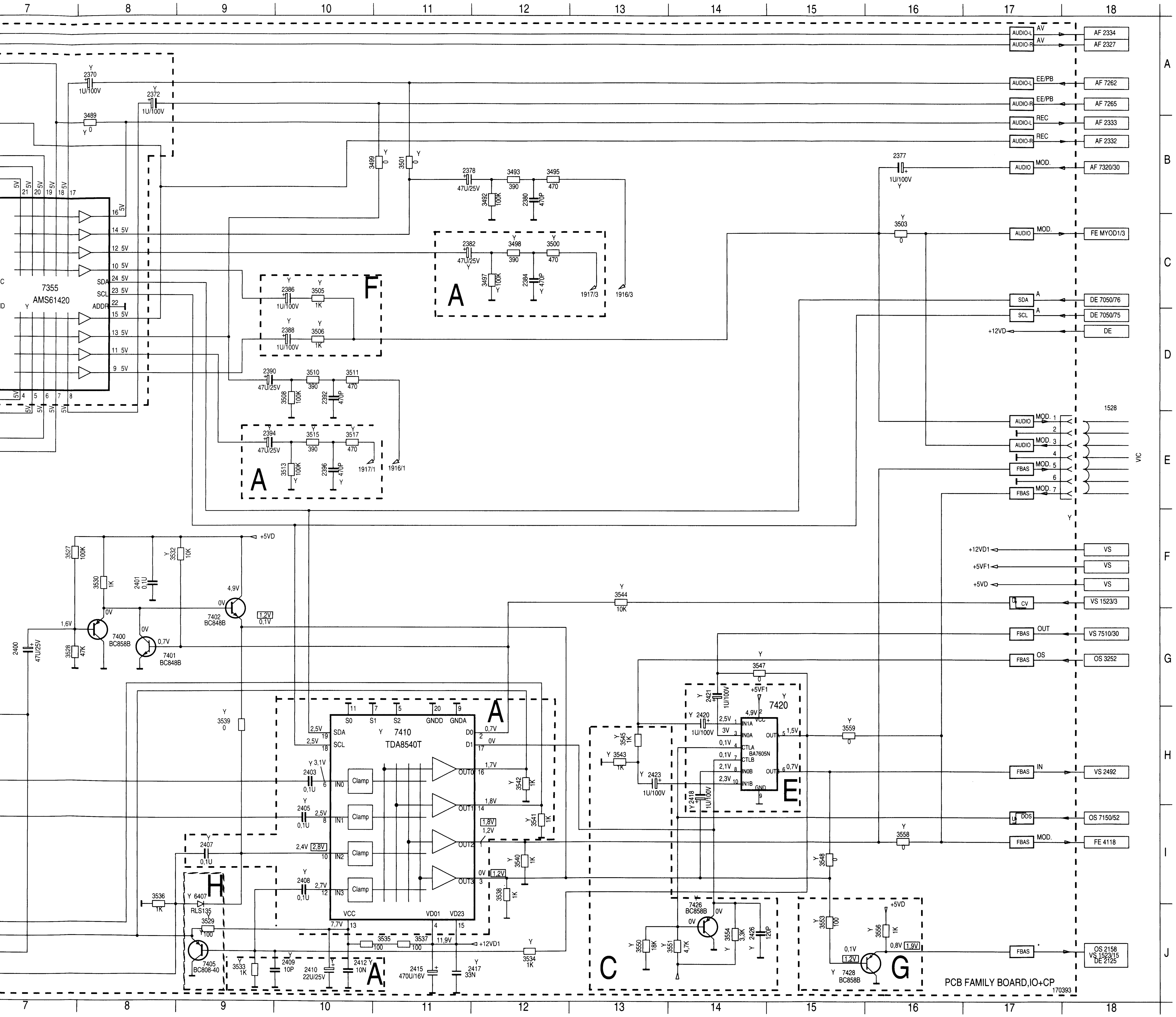
▭V DC Voltages measured in record

1052	B11
1055	E11
1060	G7
1503	C14
1504	A14
1505	B14
2203	B10
2205	C10
2207	B11
2210	F4
2212	F4
2213	E4
2215	E4
2217	C5
2218	C5
2220	D6
2222	C6
2223	C6
2225	D6
2228	F9
2230	E10
2232	F10
2235	D11
2237	C12
2240	D11
2242	D12
2243	E10
2245	G5
2247	H4
2250	H5
2252	G6
2253	H6
2255	G7
2256	H7
2257	G8
3272	C9
3274	B9
3275	B9
3277	A9
3280	B9
3282	B11
3283	B11
3285	C11
3290	E4
3292	F4
3295	F4
3297	E4
3300	E4
3302	D5
3303	D5
3305	C5
3307	D6
3308	C6
3310	D9
3312	D10
3313	E10
3314	C12
3315	D11
3316	E11
3318	F12
3320	D12
3321	D12
3323	D12
3325	E12
3327	E13
3330	G4
3332	H5
3333	H5
3335	H6
3337	G5
3338	G6
3340	G6
3342	G6
3345	H7
3347	G8
3350	H12
6204	B9
6243	E13
7203	A9
7204	B9
7207	B10
7220	E7
7235	E11
7242	D12
7243	D12
7250	I5
7259	H11

POS.-NR	FOR SETS
A 2235 3314	WITH DUBBING
2232	WITH DUBBING 5,6N2,5% WITHOUT DUBBING 10N2,5%
2243	WITH DUBBING
3290	WITH MICRO 39K WITHOUT MICRO 68K
3292	WITH DUBBING
1504	WITHOUT DUBBING
1505	WITH AV2 1K

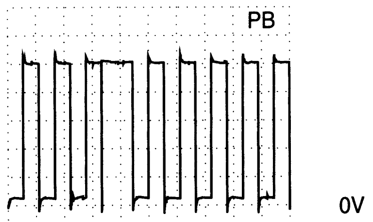
Family Board – IN/OUT CP (IO)


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
A
B
C
D
E
F
G
H
I
J
FE 7780/12
FE 7780/11
AF 1518/3
AF 1518/2
AF
AUDIO-L
AUDIO-R
E3
UIP
1527
NC
AV-1
DE 6093
DE 1510/7
DE 7095/12
DE 1510/8
EN-FB
AV-2
PCB DISPLAY CONTROL IIB,DC (BEDIENEINHEIT IIB/ KEYBOARD UNIT)
1514
FE 4180
FBAS
HF
EUROAV-1(OR/OG)
1916
(Decoder)
EUROAV-2(BL/BU)
1917
7355
AMS61420
VCC
GND
SDA
SCL
ADDR
9,9V
5V
+12VD
+5VD
+12VD1
7410
TDA8540T
S0
S1
S2
GNDD
GNDA
D0
D1
IN0
IN1
IN2
IN3
OUT0
OUT1
OUT2
OUT3
Clamp
VCC
VD01
VD23
7420
BA7605N
IN1A
IN0A
CTLA
CTLB
IN0B
IN1B
OUT
+5VF1
7400
BC858B
7401
BC848B
7402
BC848B
7398
BC818-40
7405
BC808-40
7426
BC858B
7428
BC858B
6407
RLS135
6397
6398
6400
6402
6404
6405
A
B
C
D
E
F
G
H

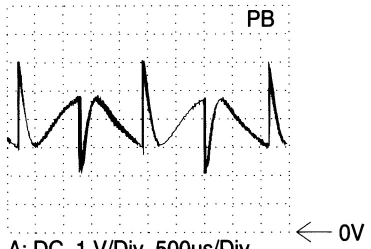

7355
AMS61420
SDA
SCL
ADDR
7410
TDA8540T
SDA
SCL
S0
S1
S2
GNDD
GNDA
D0
D1
IN0
IN1
IN2
IN3
Clamp
OUT0
OUT1
OUT2
OUT3
VCC
VD01
VD23
7420
BA7605N
IN1A
IN0A
CTLA
CTLB
IN0B
IN1B
OUT
GND
VCC
7400
BC858B
7401
BC848B
7402
BC848B
7405
BC808-40
7426
BC858B
7428
BC858B
6407
RLS135
2370
1U/100V
2372
1U/100V
3489
2377
1U/100V
3503
2378
47U/25V
3493
390
3495
470
3492
100K
2380
470P
2382
47U/25V
3498
390
3500
470
3497
100K
2384
470P
2386
1U/100V
3505
1K
2388
1U/100V
3506
1K
2390
47U/25V
3510
390
3511
470
3508
100K
2392
470P
2394
47U/25V
3515
390
3517
470
3513
100K
2396
470P
1917/3
1916/3
1917/1
1916/1
3499
3501
3527
100K
3530
1K
2401
0,1U
3532
10K
3528
47K
2400
47U/25V
3544
10K
3539
0
3547
0
2421
1U/100V
2420
1U/100V
2423
1U/100V
2418
1U/100V
3545
1K
3543
1K
3559
0
3542
1K
3541
1K
3540
1K
3538
1K
3558
0
3548
2403
0,1U
2405
0,1U
2407
0,1U
2408
0,1U
3536
1K
3529
100
3533
1K
2409
10P
2410
22U/25V
2412
10N
3535
100
3537
100
2415
470U/16V
2417
33N
3534
1K
3550
18K
3551
4,7K
3554
3,3K
2426
120P
3553
100
3556
1K
+5VD
+5VF1
+12VD
+12VD1
+12V
AUDIO-L
AUDIO-R
AUDIO
AV
EE/PB
REC
MOD.
SDA
SCL
CV
FBAS
OUT
OS
IN
DOS
AF 2334
AF 2327
AF 7262
AF 7265
AF 2333
AF 2332
AF 7320/30
FE MYOD1/3
DE 7050/76
DE 7050/75
DE
1528
V/C
VS
VS 1523/3
VS 7510/30
OS 3252
VS 2492
OS 7150/52
FE 4118
OS 2158
VS 1523/15
DE 2125
A
C
E
F
G
H
PCB FAMILY BOARD,IO+CP
170393

1514	J2
1527	E2
1528	D18
1916	F4
1917	H4
2342	A6
2343	A6
2345	A3
2346	B3
2347	B3
2348	B5
2350	C3
2352	C5
2355	D6
2357	D6
2360	D3
2362	D5
2364	E3
2366	D4
2370	A8
2372	A8
2377	B16
2378	B11
2380	B12
2382	C11
2384	C12
2386	C10
2388	D10
2390	D9
2392	D10
2394	E9
2396	E10
2400	G7
2401	F8
2403	H10
2405	I10
2407	I9
2408	I10
2409	J10
2410	J10
2412	J10
2415	J11
2417	J12
2418	H14
2420	H14
2421	G14
2423	H13
2426	J14
3460	A6
3461	B6
3462	A3
3463	B3
3465	B3
3466	B3
3468	B4
3470	C3
3472	C3
3474	B4
3475	C4
3478	C6
3480	D3
3482	D3
3484	B4
3485	D4
3487	E3
3488	D3
3489	B8
3490	D3
3491	B6
3492	B12
3493	B12
3495	B12
3497	C12
3498	C12
3499	B10
3500	C12
3501	B11
3503	C16
3505	C10
3506	D10
3508	D10
3510	D10
3511	D10
3513	E10
3515	E10
3517	E10
3519	G5
3520	F3
3521	F2
3522	F6
3523	G5
3524	J3
3525	H6
3526	H6
3527	F7
3528	G7
3529	J9
3530	F8
3532	F8
3533	J9
3534	J12
3535	J11
3536	I8
3537	J11
3538	I12
3539	H9
3540	I12
3541	I12
3542	H12
3543	H13
3544	F13
3545	H13
3547	G14
3548	I15
3550	J13
3551	J14
3553	J15
3554	J14
3556	J16
3558	I16
3559	H15
6397	F3
6398	F5
6400	F5
6402	I3
6404	H5
6405	I5
6407	I9
7355	C7
7398	H5
7400	G8
7401	G8
7402	G9
7405	J9
7410	H11
7420	H15
7426	J14
7428	J15

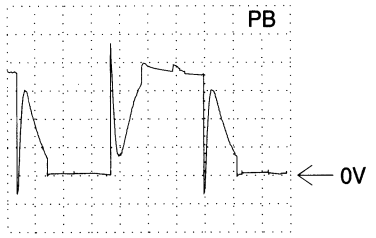
POS.-NR	FEATURES
A 3524 3525 2417 3532	WITH AV2
C	SUBTITEL RECORDING
D 3532	CINCH FRONT
E	WITH TELETEXT
G	WITH TELETEXT AND / OR VPS
H 3499 3501 3526 3539 3544 3559	WITHOUT AV2
3534	WITH AV2 1K WITHOUT AV2 100
3547 3548	WITHOUT TELETEXT
3540	MODULATOR



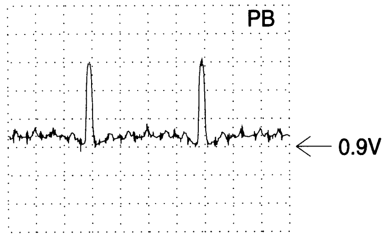
A: DC, 1 V/Div, 2ms/Div
Connector 1501, 1 PG/FG
11



A: DC, 1 V/Div, 500us/Div
Connector L9,4
(70)

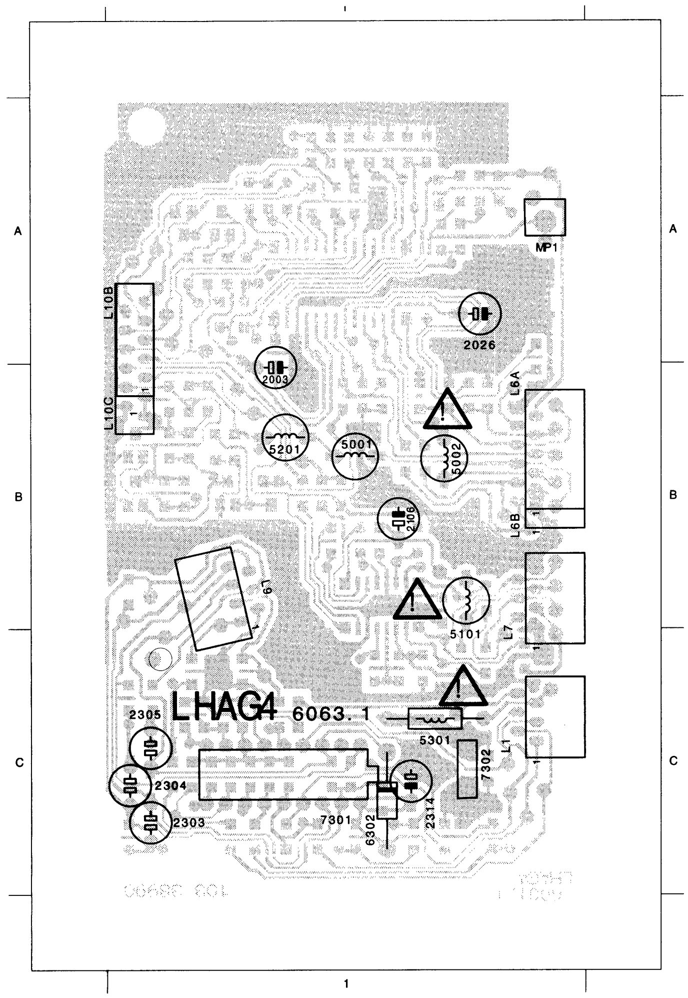


A: DC, 2 V/Div, 1ms/Div
Connector L9, 5/6/7
(71)



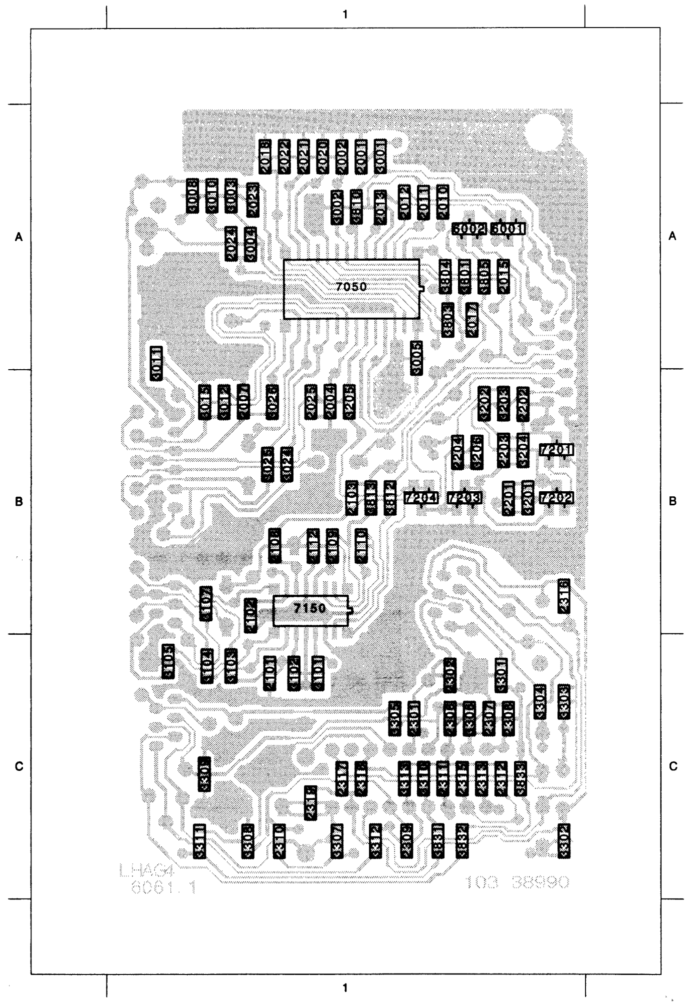
A: AC, 200mV/Div, 10ms/Div
Connector L9, 3
(72)

View of Components Side (Conventional Assembly)


A
B
C
1
L10B
L10C
2003
2026
MP1
L6A
L6B
5201
5001
5002
2106
L9
L7
5101
LHAG4 6063.1
2305
5301
7302
L1
2304
2303
7301
6302
2314
103 38990

2003	B	1
2026	A	1
2106	B	1
2303	C	1
2304	C	1
2305	C	1
2314	C	1
5001	B	1
5002	B	1
5101	B	1
5201	B	1
5301	C	1
6302	C	1
7301	C	1
7302	C	1
L1	C	1
L6A	B	1
L6B	B	1
L7	B	1
L9	B	1
L10B	B	1
L10C	B	1
MP1	A	1

View of Solder Side (Chip Assembly)

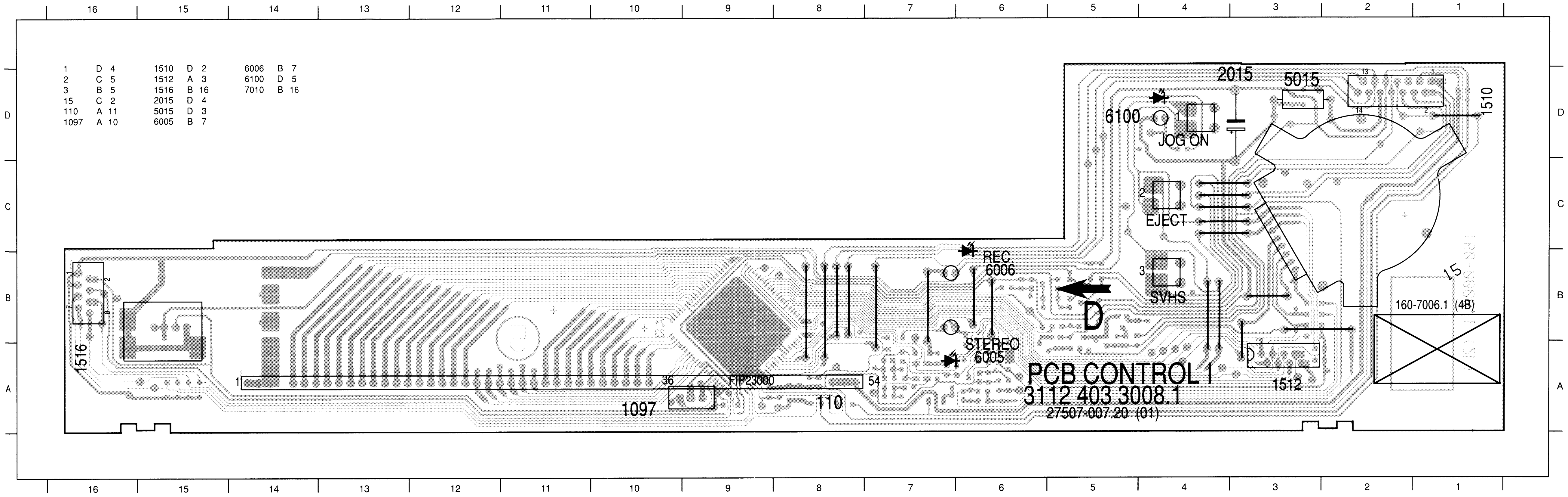

A
B
C
1
7050
7150
7201
7202
7203
7204
LHAG4 6061.1
103 38990

2001	A	1
2002	A	1
2004	B	1
2007	B	1
2010	A	1
2011	A	1
2012	A	1
2013	A	1
2015	A	1
2017	A	1
2018	A	1
2020	A	1
2021	A	1
2022	A	1
2023	A	1
2024	A	1
2025	B	1
2101	C	1
2102	B	1
2103	B	1
2108	B	1
2109	B	1
2110	B	1
2112	B	1
2201	B	1
2202	B	1
2203	B	1
2204	B	1
2301	C	1
2302	C	1
2306	C	1
2307	C	1
2308	C	1
2309	C	1
2310	C	1
2311	C	1
2312	C	1
2313	C	1
2315	C	1
2316	B	1
2317	C	1
2318	C	1
2319	C	1
3001	A	1
3002	A	1
3003	A	1
3004	A	1
3005	A	1
3008	A	1
3010	A	1
3011	A	1
3012	B	1
3015	B	1
3024	B	1
3025	B	1
3026	B	1
3101	C	1
3102	C	1
3103	C	1
3104	C	1
3105	C	1
3107	B	1
3201	B	1
3202	B	1
3203	B	1
3204	B	1
3205	B	1
3206	B	1
3301	C	1
3302	C	1
3303	C	1
3304	C	1
3305	C	1
3306	C	1
3307	C	1
3308	C	1
3309	C	1
3310	C	1
3311	C	1
3312	C	1
3313	C	1
3801	A	1
3803	A	1
3804	A	1
3805	A	1
3810	A	1
3812	B	1
3813	B	1
3831	C	1
3832	C	1
3833	C	1
6001	A	1
6002	A	1
7050	A	1
7150	B	1
7201	B	1
7202	B	1
7203	B	1
7204	B	1

Keyboard Control Unit I

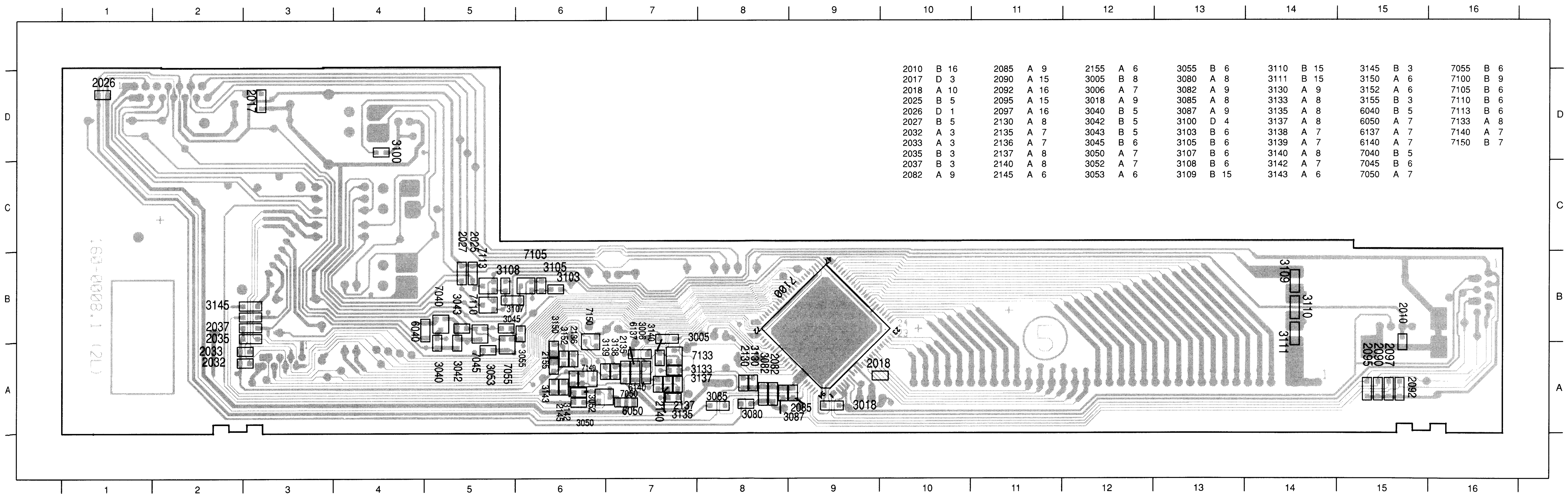
1510 –> Family Board
1512 –> Keyboard Control Unit III
1516 –> Keyboard Control Unit II

View of Components Side (Conventional Assembly)


16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
D
C
B
A
2015
5015
1510
6100
JOG ON
EJECT
SVHS
REC.
6006
STEREO
6005
D
1516
1097
110
36
FIP23000
54
1
PCB CONTROL I
3112 403 3008.1
27507-007.20 (01)
1512
160-7006.1 (4B)

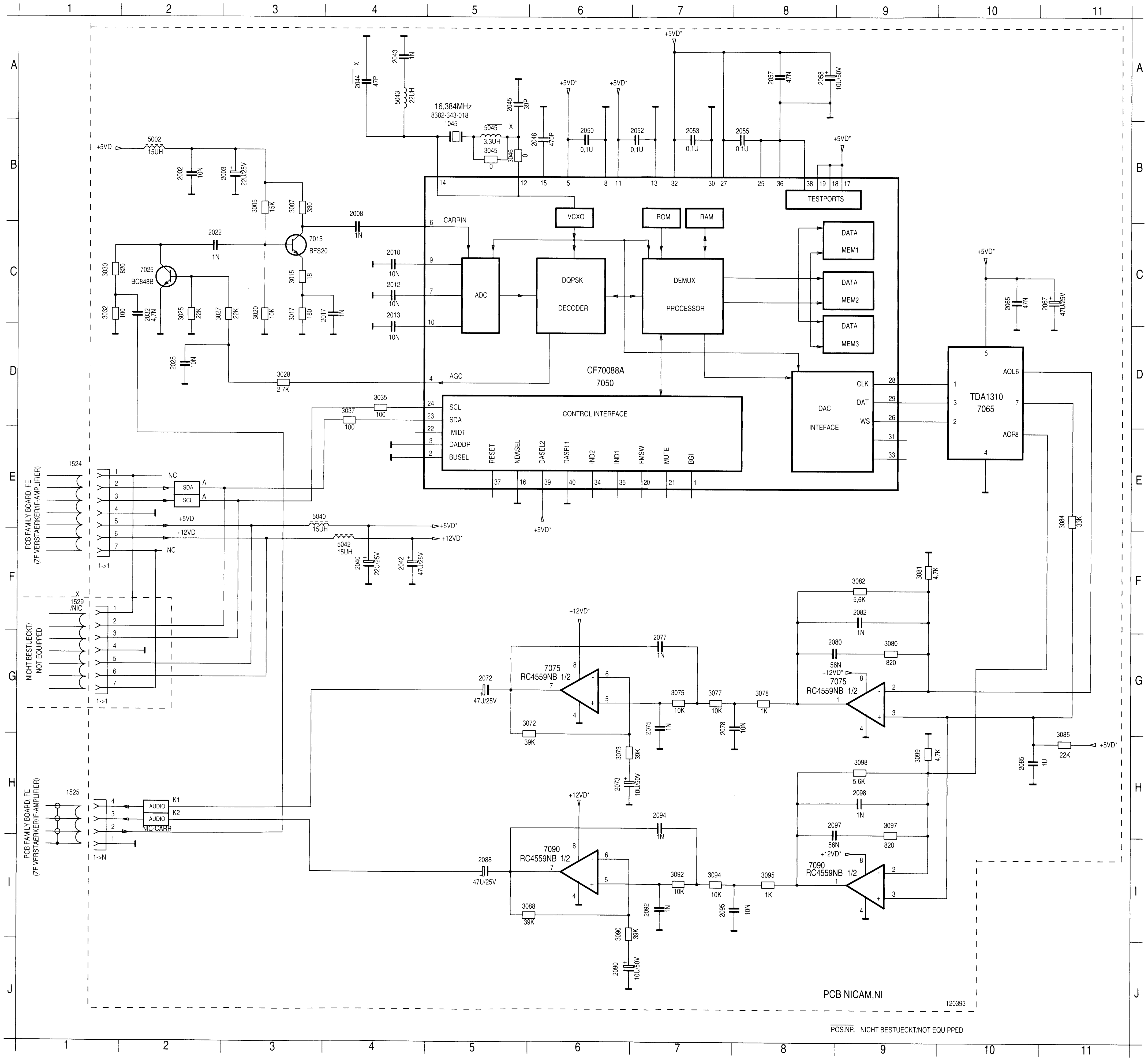
1	D	4	1510	D	2	6006	B	7
2	C	5	1512	A	3	6100	D	5
3	B	5	1516	B	16	7010	B	16
15	C	2	2015	D	4			
110	A	11	5015	D	3			
1097	A	10	6005	B	7			

View of Solder Side (Chip Assembly)


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
D
C
B
A
2026
2017
3100
2027
2025
7113
7105
3108
3105
3103
3145
2037
2035
2033
2032
7040
3043
7110
3107
3045
6040
3040
3042
7045
3053
7055
3055
7150
3005
7133
3133
3137
3085
3080
3087
2085
3018
2018
2130
3130
3082
2082
7100
2155
3143
3142
2145
3050
6050
2137
3135
2140
3109
3110
3111
2010
2097
2090
2095
2092

2010	B	16	2085	A	9	2155	A	6	3055	B	6	3110	B	15	3145	B	3	7055	B	6
2017	D	3	2090	A	15	3005	B	8	3080	A	8	3111	B	15	3150	A	6	7100	B	9
2018	A	10	2092	A	16	3006	A	7	3082	A	9	3130	A	9	3152	A	6	7105	B	6
2025	B	5	2095	A	15	3018	A	9	3085	A	8	3133	A	8	3155	B	3	7110	B	6
2026	D	1	2097	A	16	3040	B	5	3087	A	9	3135	A	8	6040	B	5	7113	B	6
2027	B	5	2130	A	8	3042	B	5	3100	D	4	3137	A	8	6050	A	7	7133	A	8
2032	A	3	2135	A	7	3043	B	5	3103	B	6	3138	A	7	6137	A	7	7140	A	7
2033	A	3	2136	A	7	3045	B	6	3105	B	6	3139	A	7	6140	A	7	7150	B	7
2035	B	3	2137	A	8	3050	A	7	3107	B	6	3140	A	8	7040	B	5			
2037	B	3	2140	A	8	3052	A	7	3108	B	6	3142	A	7	7045	B	6			
2082	A	9	2145	A	6	3053	A	6	3109	B	15	3143	A	6	7050	A	7			

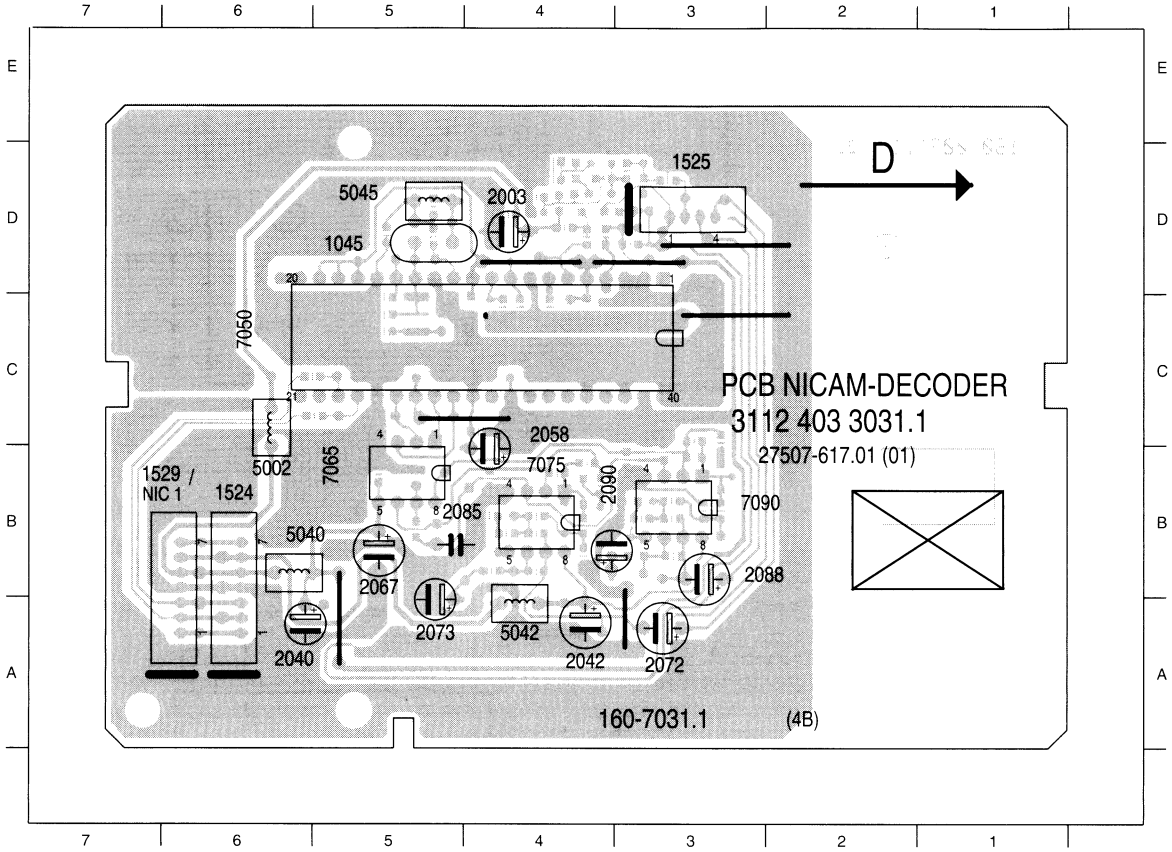
NICAM (NI)


1 2 3 4 5 6 7 8 9 10 11
A B C D E F G H I J
+5VD
5002 15UH
2002 10N
2003 22U/25V
3005 15K
3007 330
2008 1N
7015 BFS20
2022 1N
3030 820
7025 BC848B
3032 100
2032 4,7N
3025 22K
3027 22K
3020 10K
3015 18
3017 180
2017 1N
2028 10N
3028 2,7K
2044 47P
2043 1N
5043 22UH
16,384MHz
8382-343-018
1045
5045 3,3UH
3045 0
3046 0
2045 39P
2048 470P
+5VD*
2050 0,1U
2052 0,1U
2053 0,1U
2055 0,1U
2057 47N
2058 10U/50V
TESTPORTS
VCXO
ROM
RAM
CARRIN
2010 10N
2012 10N
2013 10N
ADC
DQPSK DECODER
DEMUX PROCESSOR
DATA MEM1
DATA MEM2
DATA MEM3
AGC
CF70088A
7050
3035 100
3037 100
SCL
SDA
IMIDT
DADDR
BUSEL
CONTROL INTERFACE
RESET NDASEL DASEL2 DASEL1 IND2 IND1 FMSW MUTE BGI
DAC INTEFACE
CLK
DAT
WS
TDA1310
7065
AOL6
AOR8
2065 47N
2067 47U/25V
1524
PCB FAMILY BOARD, FE (ZF VERSTAERKER/IF-AMPLIFIER)
NC
SDA
SCL
+5VD
+12VD
+12VD*
5040 15UH
5042 15UH
2040 22U/25V
2042 47U/25V
1->1
1529 /NIC
NICHT BESTUECKT/ NOT EQUIPPED
1525
AUDIO K1
AUDIO K2
NIC-CARR
1->N
2072 47U/25V
7075 RC4559NB 1/2
2077 1N
3072 39K
3073 39K
2073 10U/50V
3075 10K
2075 1N
3077 10K
2078 10N
3078 1K
3082 5,6K
3081 4,7K
2082 1N
2080 56N
3080 820
3084 33K
3085 22K
2085 1U
2088 47U/25V
7090 RC4559NB 1/2
2094 1N
3088 39K
3090 39K
2090 10U/50V
3092 10K
2092 1N
3094 10K
2095 10N
3095 1K
3098 5,6K
3099 4,7K
2098 1N
2097 56N
3097 820
PCB NICAM,NI
120393
POS.NR. NICHT BESTUECKT/NOT EQUIPPED

1045	B5
1524	E1
1525	H1
1529	F1
2002	B2
2003	B3
2008	B4
2010	C4
2012	C4
2013	C4
2017	C3
2022	C2
2028	D2
2032	C2
2040	F4
2042	F4
2043	A4
2044	A4
2045	A5
2048	B6
2050	B6
2052	B7
2053	B7
2055	B8
2057	A8
2058	A8
2065	C10
2067	C11
2072	G5
2073	H6
2075	G7
2077	G7
2078	G7
2080	G9
2082	F9
2085	H10
2088	I5
2090	J6
2092	I7
2094	H7
2095	I7
2097	H9
2098	H9
3005	B3
3007	B3
3015	C3
3017	C3
3020	C3
3025	C2
3027	C2
3028	D3
3030	C1
3032	C1
3035	D4
3037	D4
3045	B5
3046	B5
3072	G6
3073	H6
3075	G7
3077	G7
3078	G8
3080	G9
3081	F9
3082	F9
3084	E11
3085	G11
3088	I6
3090	I6
3092	I7
3094	I7
3095	I8
3097	H9
3098	H9
3099	H9
5002	B2
5040	E3
5042	F4
5043	A4
5045	B5
7015	C3
7025	C2
7050	D6
7065	D10
7075	G9
7075	G6
7090	I6
7090	I8

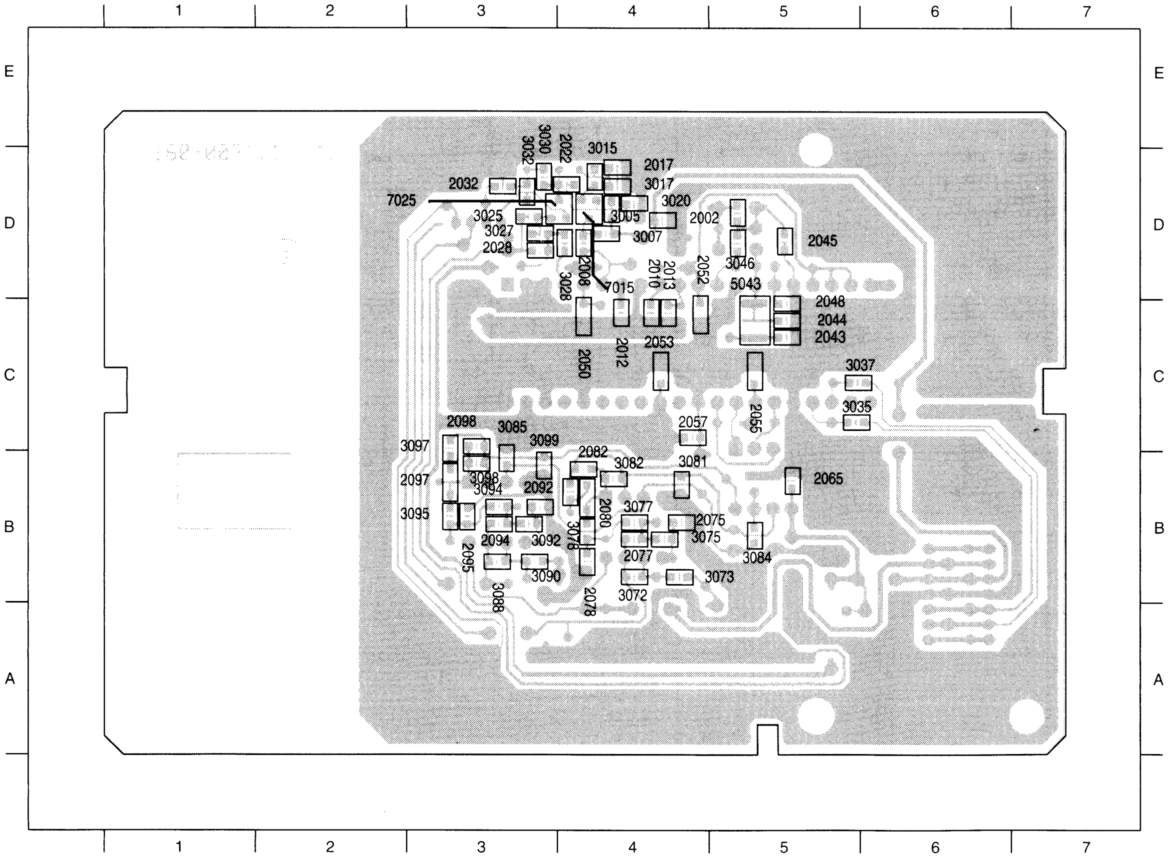
View of Components Side
(Conventional Assembly)

1525	D	3
1524	B	6
1529	B	6
7050	C	4
2003	D	4
2040	A	6
2058	C	4
2073	B	5
2090	B	4
2042	A	4
2067	B	5
2072	A	3
2088	B	3
2085	B	5
5002	C	6
5040	B	6
5042	A	4
5045	D	5
1045	D	5
7075	B	4
7090	B	3
7065	B	5

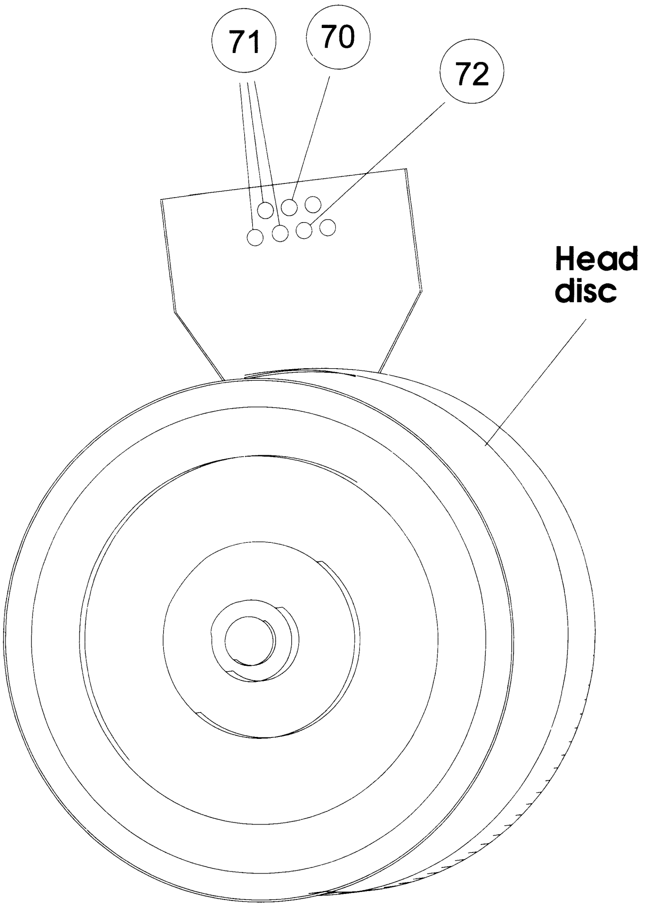

7
6
5
4
3
2
1
E
D
C
B
A
1525
D
5045
2003
1045
20
1
7050
21
40
PCB NICAM-DECODER
3112 403 3031.1
27507-617.01 (01)
2058
7075
2090
7090
1529 /
NIC 1
1524
5002
7065
5040
2085
2067
2073
5042
2042
2072
2088
2040
160-7031.1
(4B)

View of Solder Side
(Chip Assembly)

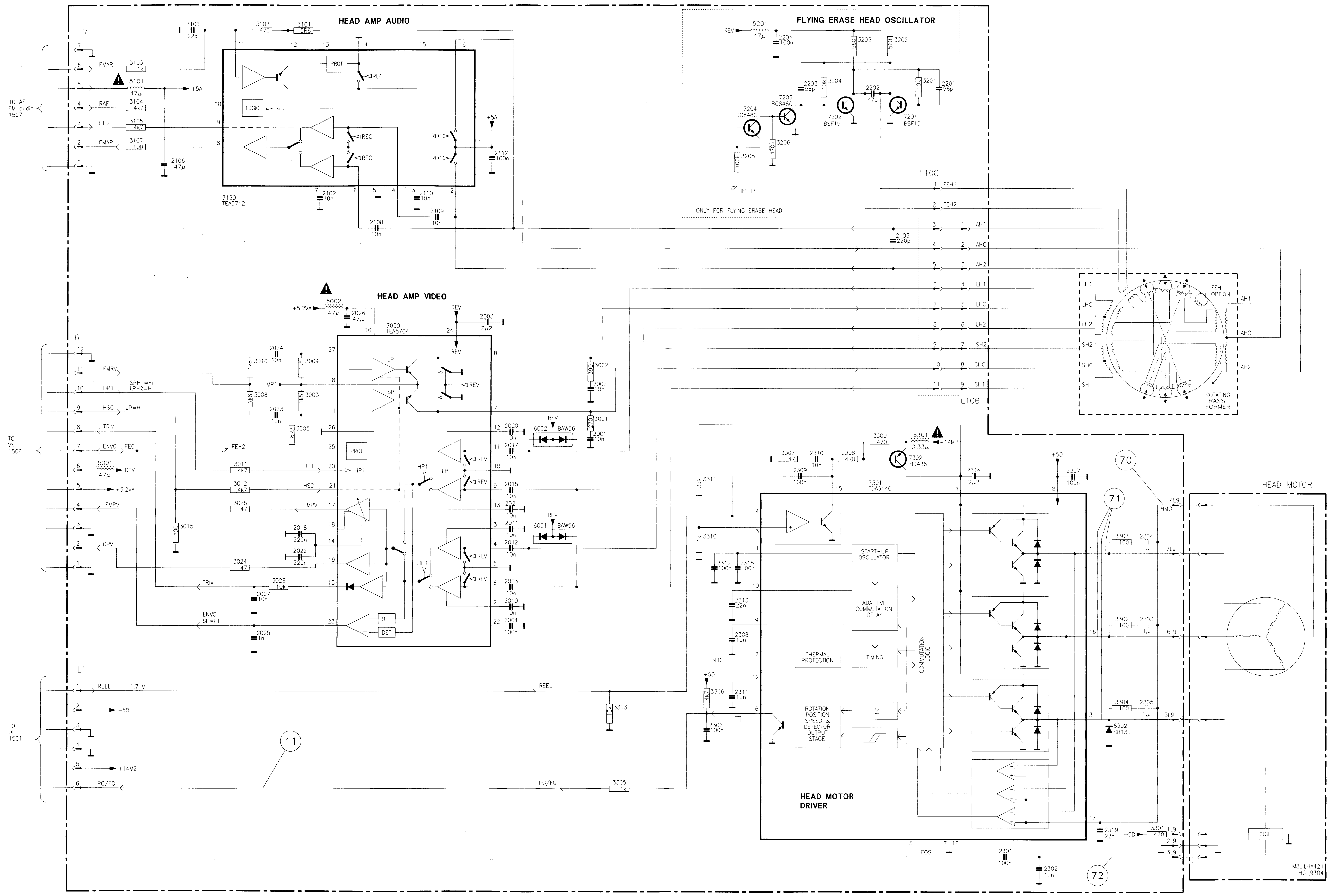
2002	D	4
2008	D	4
2010	C	4
2012	C	4
2013	C	4
2017	D	4
2022	D	4
2028	D	3
2032	D	3
2043	C	5
2044	C	5
2045	D	5
2048	D	5
2057	C	4
2065	B	5
2075	B	4
2077	B	4
2078	B	4
2082	B	4
2092	B	3
2094	B	3
2095	B	3
2098	C	3
2050	C	4
2052	C	4
2053	C	4
2055	C	5
2080	B	4
2097	B	3
5043	C	5
3005	D	4
3007	D	4
3015	D	4
3017	D	4
3020	D	4
3025	D	3
3027	D	3
3028	D	4
3030	D	3
3032	D	3
3035	C	6
3037	C	6
3045	D	5
3046	D	5
3072	B	4
3073	B	4
3075	B	4
3077	B	4
3078	B	4
3080	B	4
3081	B	4
3082	B	4


1
2
3
4
5
6
7
E
D
C
B
A
3032
3030
2022
3015
2017
3017
2032
7025
3020
3025
3005
2002
3027
3007
2028
2045
2008
2013
2010
2052
3046
3028
7015
5043
2048
2044
2043
2053
2012
2050
3037
2055
3035
2098
3085
2057
3099
3097
2082
3082
3081
2097
3098
3094
2092
2065
3095
3077
2080
2075
3075
2094
3092
3078
2077
3084
2095
3090
3073
3088
2078
3072

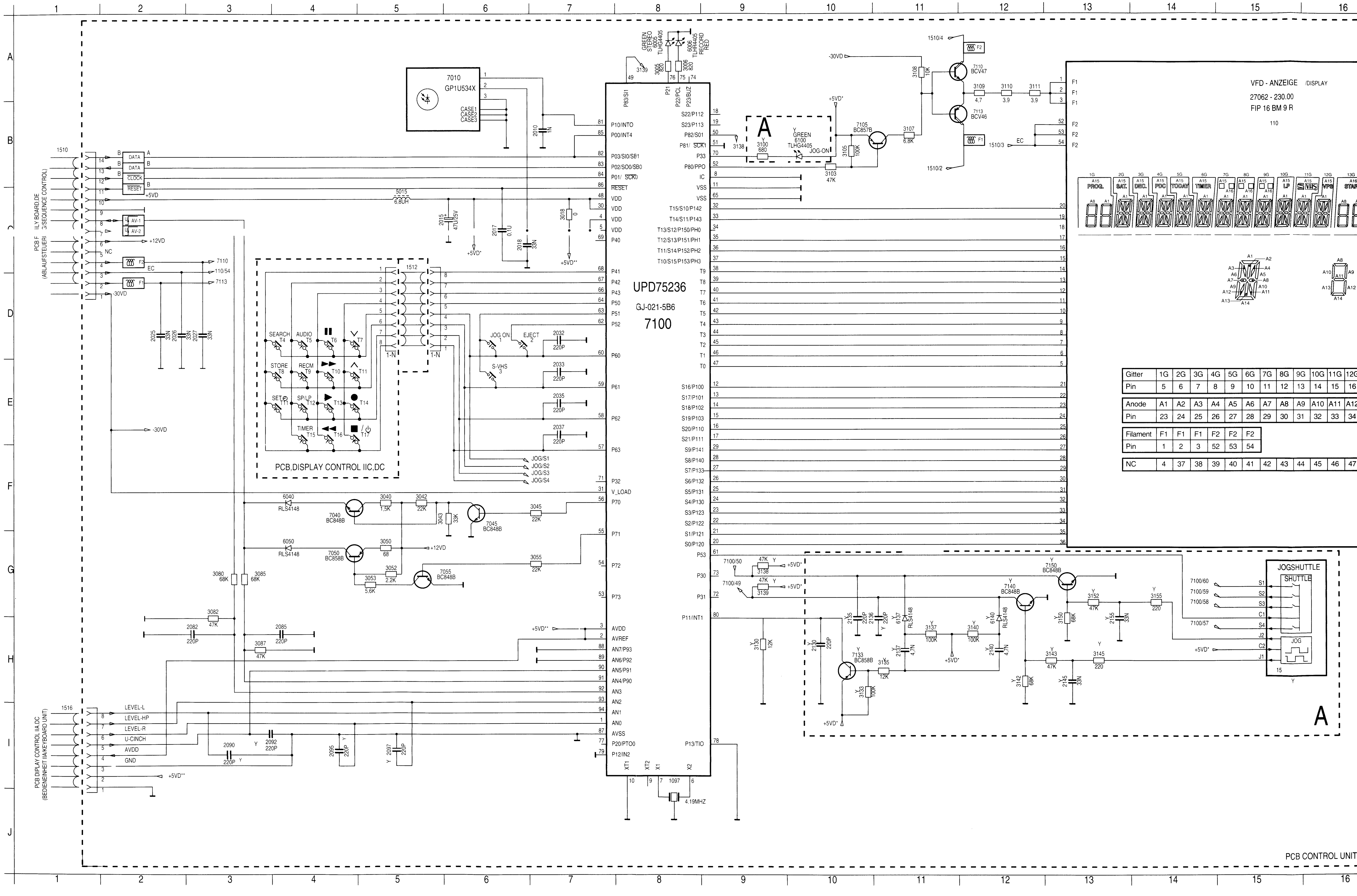
3084	B	5
3085	B	3
3088	B	3
3090	B	3
3092	B	3
3094	B	3
3095	B	3
3097	C	3
3098	B	3
3099	B	3
7015	D	4
7025	D	4


Head disc

Head Amplifier (HV/HA)


HEAD AMP AUDIO
7150
TEA5712
PROT
LOGIC
REC
FLYING ERASE HEAD OSCILLATOR
ONLY FOR FLYING ERASE HEAD
7204 BC848C
7203 BC848C
7202 BSF19
7201 BSF19
L10C
L10B
FEH1
FEH2
AH1
AHC
AH2
LH1
LHC
LH2
SH2
SHC
SH1
FEH OPTION
ROTATING TRANS- FORMER
L7
TO AF FM audio 1507
FMAR
FMAP
RAF
HP2
+5A
HEAD AMP VIDEO
7050
TEA5704
+5.2VA
REV
LP
SP
MP1
DET
BAW56
L6
TO VS 1506
FMRV
HP1
HSC
TRIV
ENVC
FMPV
CPV
SPH1=HI LPH2=HI
LP=HI
ENVC SP=HI
iFEO
iFEH2
L1
TO DE 1501
REEL 1.7 V
+5D
+14M2
PG/FG
HEAD MOTOR DRIVER
7301
TDA5140
7302
BD436
START-UP OSCILLATOR
ADAPTIVE COMMUTATION DELAY
THERMAL PROTECTION
TIMING
COMMUTATION LOGIC
ROTATION POSITION SPEED & DETECTOR OUTPUT STAGE
:2
N.C.
POS
6302 SB130
HEAD MOTOR
HMO
COIL
4L9
7L9
6L9
5L9
1L9
2L9
3L9
11
70
71
72
MB_LHA421
HG_9304

Keyboard Control Unit I/III


UPD75236
GJ-021-5B6
7100
7010
GP1U534X
VFD - ANZEIGE /DISPLAY
27062 - 230.00
FIP 16 BM 9 R
PCB,DISPLAY CONTROL IIC,DC
PCB CONTROL UNIT
PCB FAMILY BOARD,DE (ABLAUFSTEUERUNG,SEQUENCE CONTROL)
PCB DIPLAY CONTROL IIA,DC (BEDIENEINHEIT IIA,KEYBOARD UNIT)
JOGSHUTTLE
SHUTTLE
JOG
SEARCH
AUDIO
STORE
RECM
SET
SP/LP
TIMER
JOG ON
EJECT
S-VHS
LEVEL-L
LEVEL-HP
LEVEL-R
U-CINCH
AVDD
GND
4.19MHZ
A

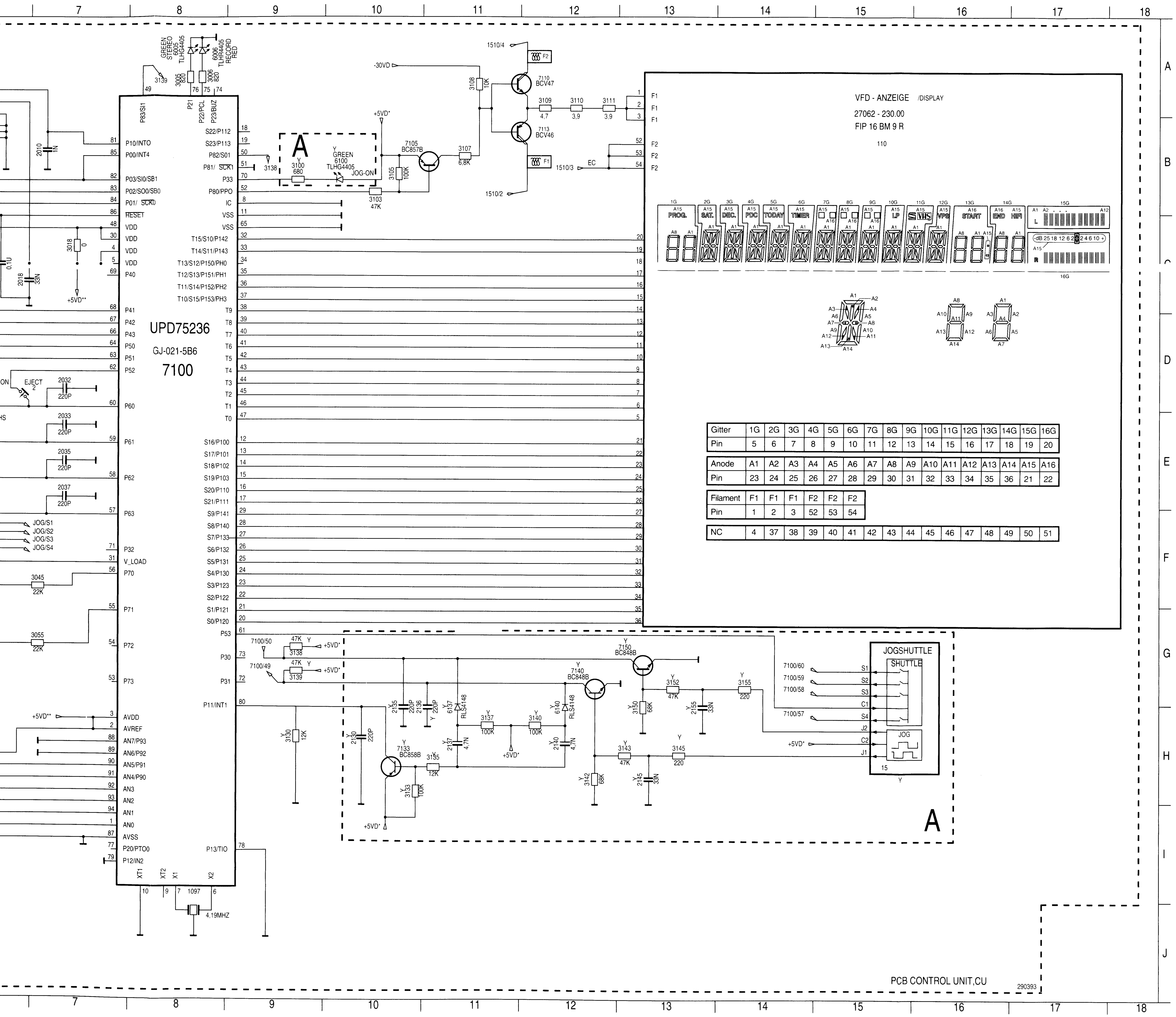
Gitter	1G	2G	3G	4G	5G	6G	7G	8G	9G	10G	11G	12G
Pin	5	6	7	8	9	10	11	12	13	14	15	16

Anode	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
Pin	23	24	25	26	27	28	29	30	31	32	33	34

Filament	F1	F1	F1	F2	F2	F2
Pin	1	2	3	52	53	54

NC	4	37	38	39	40	41	42	43	44	45	46	47

Keyboard Control Unit III


UPD75236
GJ-021-5B6
7100
VFD - ANZEIGE /DISPLAY
27062 - 230.00
FIP 16 BM 9 R
110
JOGSHUTTLE
SHUTTLE
JOG
A
PCB CONTROL UNIT,CU
290393
4.19MHZ
1097
7105 BC857B
7110 BCV47
7113 BCV46
7133 BC858B
7140 BC848B
7150 BC848B
6100 GREEN TLHG4405 JOG-ON
6005 GREEN STEREO TLHG4405
6006 TLHR4405 RECORD RED
-30VD
+5VD*
1510/4
1510/2
1510/3
EC
F1
F2
EJECT
JOG/S1
JOG/S2
JOG/S3
JOG/S4
PROG.
SAT.
DEC.
PDC
TODAY
TIMER
LP
VPS
START
END
HIFI

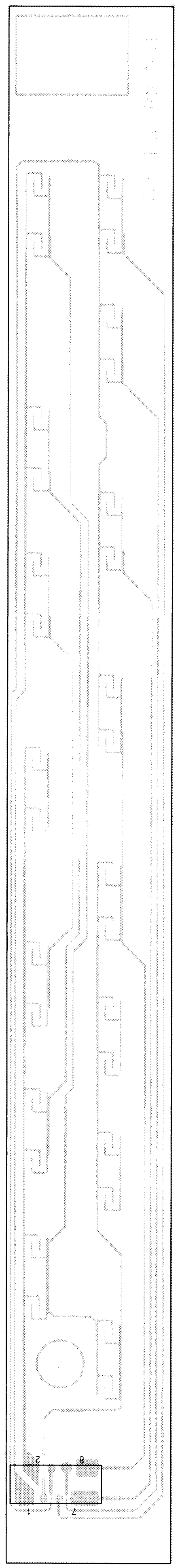
Gitter	1G	2G	3G	4G	5G	6G	7G	8G	9G	10G	11G	12G	13G	14G	15G	16G
Pin	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Anode	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16
Pin	23	24	25	26	27	28	29	30	31	32	33	34	35	36	21	22

Filament	F1	F1	F1	F2	F2	F2
Pin	1	2	3	52	53	54

NC	4	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51

1	D6
1097	I8
110	B15
15	H15
1510	B1
1512	C5
1516	I1
2	D7
2010	B7
2015	C6
2017	C6
2018	C6
2025	D2
2026	D2
2027	D3
2032	D7
2033	E7
2035	E7
2037	E7
2082	H3
2085	H4
2090	I3
2092	I3
2095	I4
2097	I5
2130	H10
2135	H10
2136	H11
2137	H11
2140	H12
2145	H13
2155	H13
3	E6
3005	A8
3006	A8
3018	C7
3040	F5
3042	F5
3043	F5
3045	F7
3050	G5
3052	G5
3053	G5
3055	G7
3080	G3
3082	G3
3085	G3
3087	H3
3100	B9
3103	B10
3105	B10
3107	B11
3108	A11
3109	A12
3110	A12
3111	A12
3130	H9
3133	H10
3135	H11
3137	H11
3138	G9
3139	G9
3140	H12
3142	H12
3143	H13
3145	H13
3150	H13
3152	G13
3155	G14
5015	C5
6005	A8
6006	A8
6040	F4
6050	G4
6100	B10
6137	H11
6140	H12
7010	A6
7040	F4
7045	F6
7050	G4
7055	G6
7100	D8
7105	B10
7110	A12
7113	B12
7133	H10
7140	G12
7150	G13

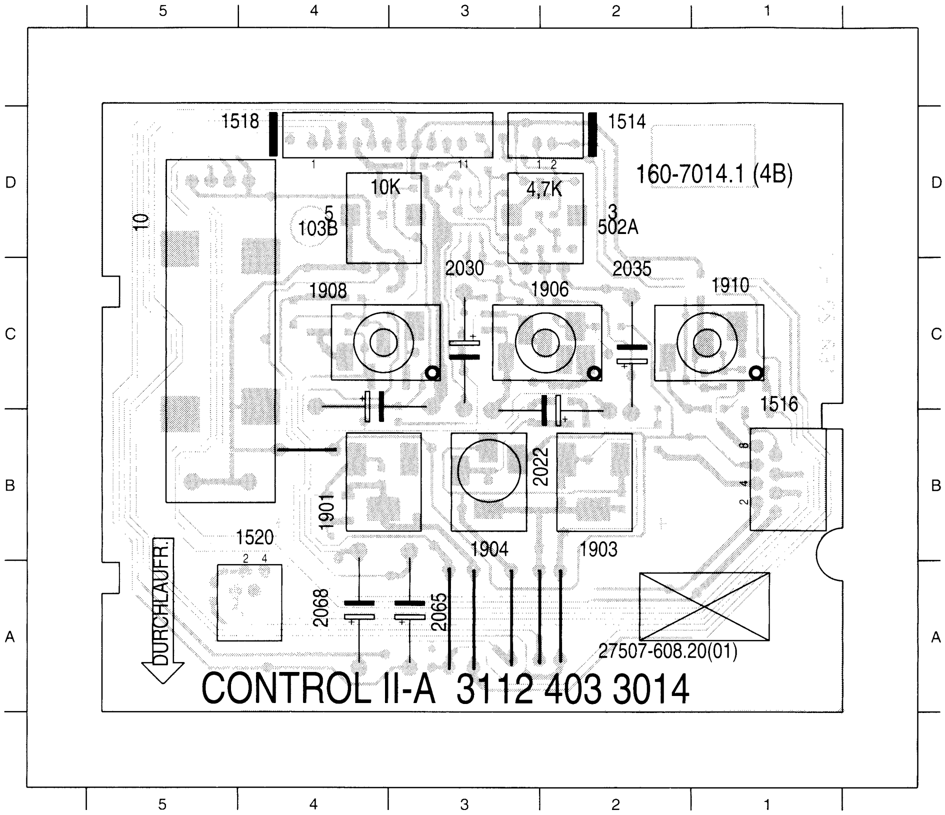


Keyboard Contol Unit II

1514, 1518, 1520 -> Family Board
1516 -> Keyboard Control Unit I

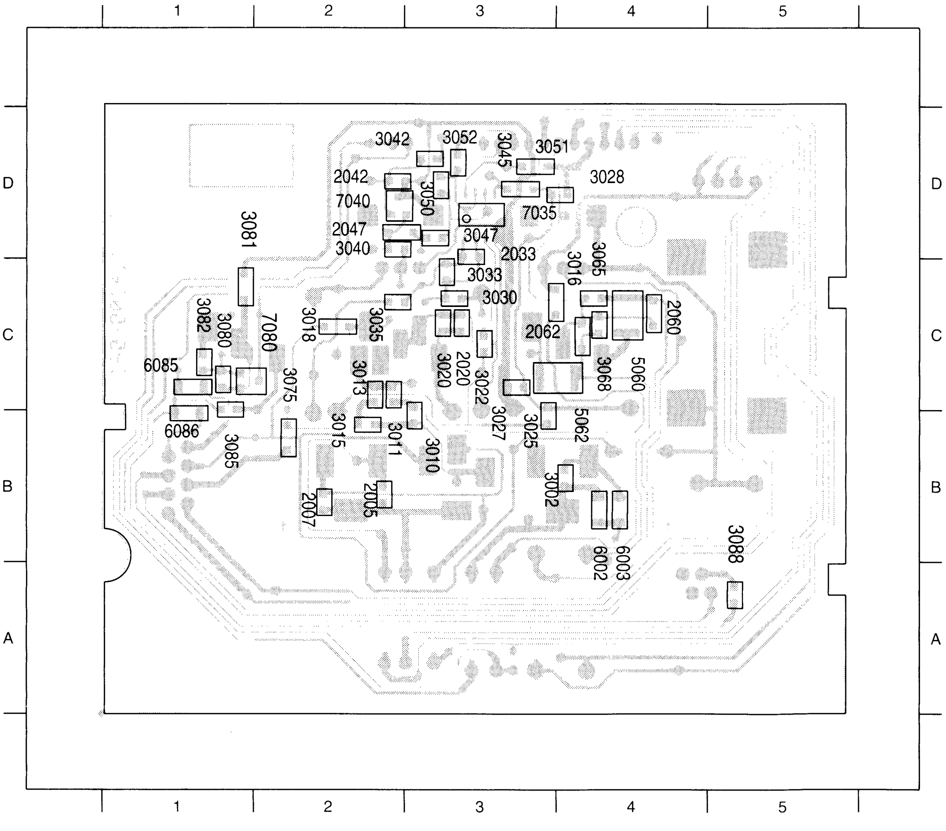
View of Components Side
(Conventional Assembly)

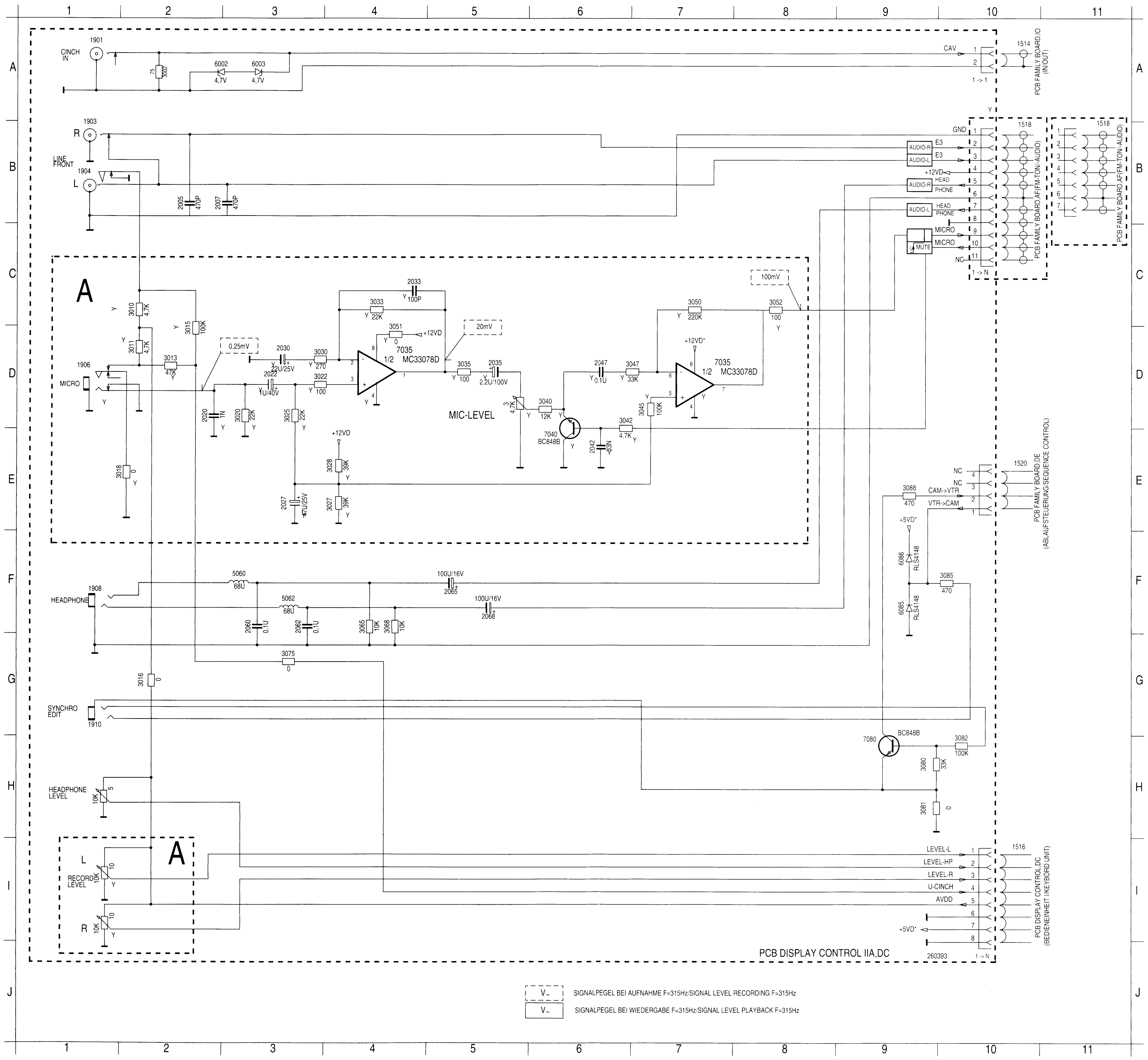
3	D	3
5	D	4
10	C	5
1514	D	3
1516	B	1
1518	D	4
1520	A	4
1901	B	4
1903	B	2
1904	B	3
1906	C	2
1908	C	4
1910	C	1
2022	C	2
2027	C	4
2030	C	3
2035	C	2
2065	A	3
2068	A	4


5
4
3
2
1
D
C
B
A
1518
1514
1
11
1 2
10K
4,7K
160-7014.1 (4B)
5
103B
3
502A
10
2030
2035
1908
1906
1910
1516
8
4
2
2022
1901
1520
2 4
1904
1903
DURCHLAUFR.
2068
2065
27507-608.20(01)
CONTROL II-A 3112 403 3014

View of Solder Side
(Chip Assembly)

2005	B	2
2007	B	2
2020	C	3
2033	D	3
2042	D	2
2047	D	3
2060	C	4
2062	C	4
3002	B	4
3010	C	3
3011	C	2
3013	C	2
3015	B	2
3016	C	4
3018	C	2
3020	C	3
3022	C	3
3025	C	3
3027	C	3
3028	D	4
3030	C	3
3033	C	3
3035	C	2
3040	D	2
3042	D	3
3045	D	3
3047	D	3
3050	D	3
3051	D	3
3052	D	3
3065	C	4
3068	C	4
3075	B	2
3080	C	1
3081	C	1
3082	C	1
3085	C	1
3088	A	5
5060	C	4
5062	C	4
6002	B	4
6003	B	4
6085	C	1
6086	C	1
7035	D	3
7040	D	2
7080	C	2


1
2
3
4
5
D
C
B
A
3042
3052
3045
3051
3028
2042
7040
3050
7035
2047
3040
3047
2033
3065
3016
3081
3033
3030
3082
3080
7080
3018
3035
2062
2060
6085
3075
3013
3020
2020
3022
3068
5060
6086
3085
3015
3011
3010
3027
3025
5062
3002
2007
2005
6003
6002
3088


CINCH IN
1901
75
3002
6002
4,7V
6003
4,7V
CAV
1514
1 -> 1
PCB FAMILY BOARD,IO (IN/OUT)
1903
R
LINE FRONT
1904
L
2005 470P
2007 470P
GND
E3
AUDIO-R
AUDIO-L
+12VD
HEAD PHONE
MICRO
U MUTE
NC
1518
1 -> N
PCB FAMILY BOARD,AF(FM-TON/-AUDIO)
A
3010 4,7K
3011 4,7K
3013 47K
3015 100K
1906
MICRO
3018 0
0,25mV
2020 1N
3020 22K
2030
22U/25V
2022
1U/40V
3030 270
3022 100
3025 22K
3033 22K
2033 100P
3051 0
+12VD
7035
1/2
MC33078D
20mV
3035 100
2035 2,2U/100V
MIC-LEVEL
3
4,7K
3040 12K
7040 BC848B
2042 33N
2047 0,1U
3047 33K
3042 4,7K
3045 100K
+12VD'
7035
1/2
MC33078D
3050 220K
3052 100
100mV
+12VD
3028 39K
2027 47U/25V
3027 39K
1520
NC
CAM->VTR
VTR->CAM
3088 470
PCB FAMILY BOARD,DE (ABLAUFSTEUERUNG/SEQUENCE CONTROL)
+5VD'
6086 RLS4148
6085 RLS4148
3085 470
1908
HEADPHONE
5060 68U
5062 68U
2060 0,1U
2062 0,1U
3065 10K
3068 10K
100U/16V
2065
100U/16V
2068
3075 0
3016 0
SYNCHRO EDIT
1910
7080
BC848B
3082 100K
3080 33K
3081 0
HEADPHONE LEVEL
10K
5
L
RECORD LEVEL
10K
10
R
10K
10
LEVEL-L
LEVEL-HP
LEVEL-R
U-CINCH
AVDD
+5VD'
1516
PCB DISPLAY CONTROL,DC (BEDIENEINHEIT /KEYBORD UNIT)
PCB DISPLAY CONTROL IIA,DC
260393
1 -> N
Y
1
2
3
4
5
6
7
8
9
10
11
A
B
C
D
E
F
G
H
I
J

V~ SIGNALPEGEL BEI AUFNAHME F=315Hz/SIGNAL LEVEL RECORDING F=315Hz

V~ SIGNALPEGEL BEI WIEDERGABE F=315Hz/SIGNAL LEVEL PLAYBACK F=315Hz

10	I1
10	I1
1514	A10
1516	I10
1518	B10
1520	E10
1901	A1
1903	B1
1904	B1
1906	D1
1908	F1
1910	G1
2005	B2
2007	B2
2020	D2
2022	D3
2027	E3
2030	D3
2033	C4
2035	D5
2042	E6
2047	D6
2060	F3
2062	F3
2065	F5
2068	F5
3	D5
3002	A2
3010	C2
3011	D2
3013	D2
3015	D2
3016	G2
3018	E2
3020	D3
3022	D3
3025	D3
3027	E4
3028	E4
3030	D3
3033	C4
3035	D5
3040	D6
3042	D6
3045	D7
3047	D7
3050	C7
3051	D4
3052	C8
3065	F4
3068	F4
3075	G3
3080	H9
3081	H9
3082	H10
3085	F10
3088	E9
5	H1
5060	F3
5062	F3
6002	A2
6003	A3
6085	F9
6086	F9
7035	D4
7035	D7
7040	E6
7080	H9

POS.NR	FOR SETS WITH
A	MICRO
1518	LINE/MIC/HEADPHONE 11 POL.
	LINE/HEADPHONE 7 POL.

4. Drive assembly

This tape deck has three motors; one providing precision drive for the scanner unit; the second providing direct drive for the capstan and belt drive for the reel tables; the third motor drives the lift and tape threading/dethreading operations.

Special features are:

Quick start
Short winding time
Automatic cleaning of video heads by cleaning roller

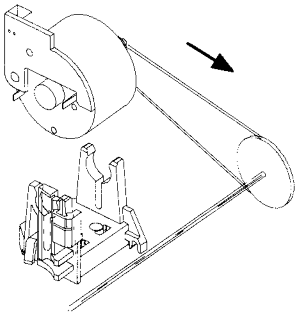
4.1 Deck parts replacement

Before repairing a deck assembly the top and bottom covers should be removed.
The procedure for the removal and refitting of the following parts is described; only the lift, the scanner, the capstan motor and the A/C head are fixed by screws.
All the other deck assembly parts are held only by snap hooks.

Manual extraction of cassette:
If, after the Eject button has been pressed, the drive does not unthread and eject the cassette, the dethreading/eject operation can also be carried out manually by turning the wheel at the rear of the threading motor.

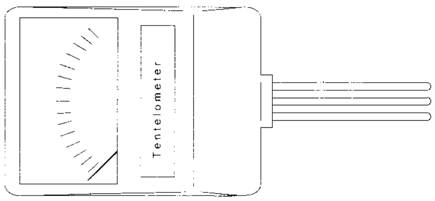
To avoid slack tape, alternate this action with the movement of the capstan motor (counter-clockwise), until the tape is completely taken into the cassette.

Fig. 1



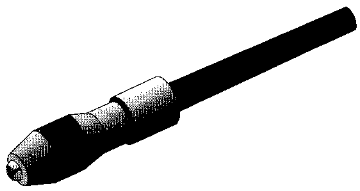
IMPORTANT:
After each repair has been carried out in the drive assembly, the first operation after repairing must be to bring the cassette compartment into "eject" position by hand.

Auxiliary tools for deck adjustment:

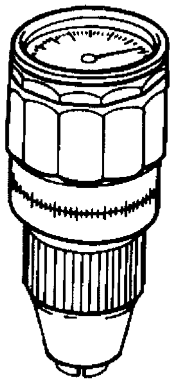


Tentelometer Ident-No. 34 0120

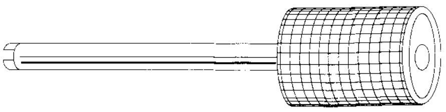
Tool for tapetension adjustment Ident-No. 34 0356



Handle Ident-No. 34 0357



Torquemeter Ident-No. 34 0114



Post adjustment screwdriver Ident-No. 34 0101

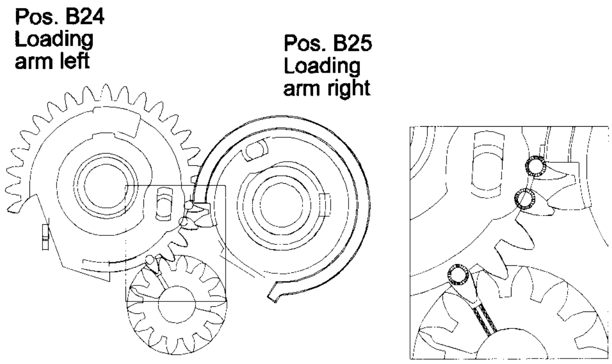
Testcassette: Tapetension 60g/300g Ident-No. 34 0156
Testcassette: Tapetension 800g Ident-No. 34 0219
Testcassette: Testpicture Ident-No. 34 0163
Torx screwdriver TX208x60

4.1.1 Deck lay out diagram

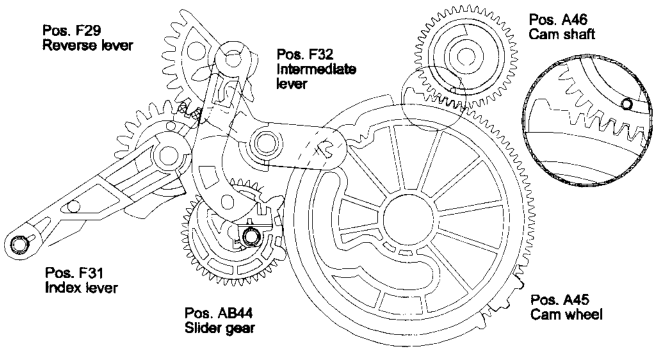
Deck in position "threaded out".

The following diagrams indicate the relative position of the gearwheels and levers when the deck is in the threaded out (cassette compartment down) position.

Top view


Pos. B24
Loading
arm left
Pos. B25
Loading
arm right

Top view


Pos. F29
Reverse lever
Pos. F32
Intermediate
lever
Pos. A46
Cam shaft
Pos. F31
Index lever
Pos. AB44
Slider gear
Pos. A45
Cam wheel

4.1.2 The Lift

To remove the lift

- Unscrew the 4 screws on the underside of the deck.
- Free the holding bracket (Fig. 2) by rotating it up and back from the upper end.
- Carefully remove the lift vertically, noting the position of the record protect operating lever.

Refitting the lift compartment:
Ensure the lift compartment is down and gear A is rotated one or two click stops anticlockwise from the down position. Manually rotate the deck drive system, without lift, from eject towards half load until the lift drive (pos.103) is just disengaged from the loader gear (pos.105). This occurs when 105 and 103 are pushed together by the cassette loader trigger moving towards the outside of the chassis. When the two positions are achieved assemble the lift to the deck and holding the two parts together, turn over and fit the four screws. Ensure that gear 103 is not pushed in and/or rotated either during or after fitting of the lift.

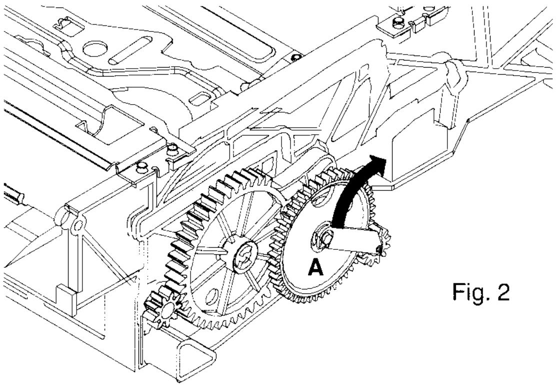
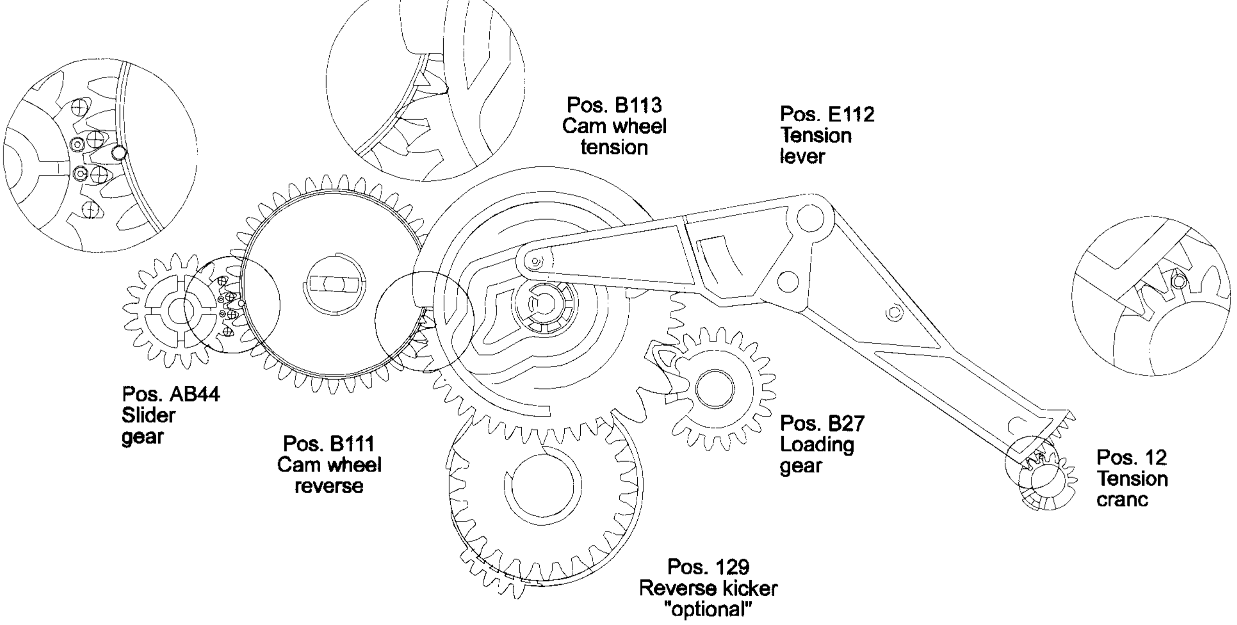


Fig. 2

Underside view


Pos. B113
Cam wheel
tension
Pos. E112
Tension
lever
Pos. AB44
Slider
gear
Pos. B111
Cam wheel
reverse
Pos. B27
Loading
gear
Pos. 12
Tension
cranc
Pos. 129
Reverse kicker
"optional"

4.1.3 Head disc replacement

- Nylon gloves should be worn when handling the head disc.
- Insert the reference pin C (included with each service head disc) through the hole in bottom of the scanner motor and turn the head disc until the pin snaps in the hole of the rotor (Fig. 3).
- Slacken the fixing screw A of the head disc and pull the head disc from the motor spindle.

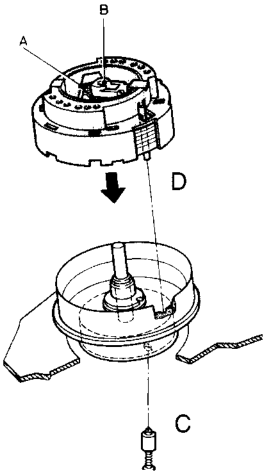


Fig. 3

Installation

- Before carrying out the installation of the the new head disc, make sure that the motor spindle is clean and undamaged (the spindle has to be free of grease and must not be touched with the bare hands).
- Position the head disc on the scanner spindle.

Attention:
The upper protection cover and the 2 Mylar films (0,15 mm thick) remain on the head disc during the fitting process (Fig. 4).

- Press the head disc down at the centre of the protective cover B (Fig. 3) with a force of 1 N.
- Tighten the fixing screw A with a torque of 20 Ncm.
- Remove the protecting cap from the head disc and withdraw the 2 Mylar films laterally from the air gap, and remove the reference pin at the bottom side of the drive assy.

After replacing the head disc, carry out the following adjustments and checks:

- Head switching pulse (gap position, chapter 3)
- Write current adjustments (chapter 3)
- Check tape path alignment (see paragraph 4.2.1)

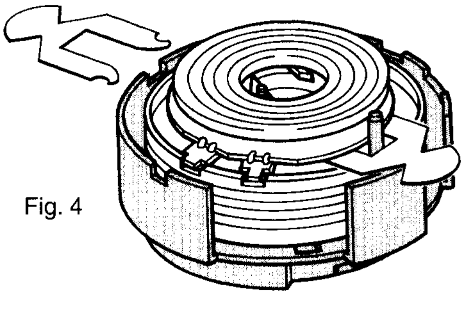


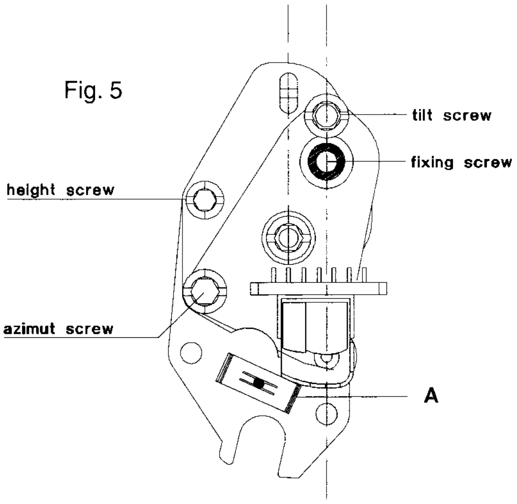
Fig. 4

4.1.4 A/C Head (Combi head) (Pos. 36)

- Remove fixing spring (A) (Fig. 5).
- Remove the fixing screw and replace the A/C head.
- Use a new fixing spring (included with new A/C head) for reassembly.

After the A/C head has been replaced, all adjustments described in paragraph 4.2.1.2 and paragraph 4.2.1.3 have to be carried out.

Fig. 5



4.1.5 Threading motor (Pos. 38)

- Remove the belt and disconnect the connector plug.
- Remove the threading motor from the motor supports (Fig. 6).

During reassembly ensure that the threading motor is correctly located in the front and rear supports.

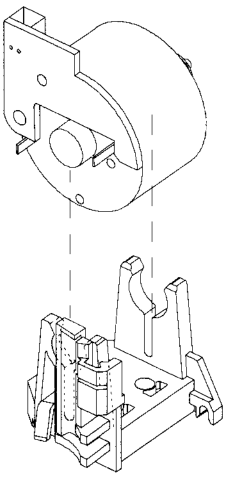


Fig. 6

4.1.6 Capstan motor (Pos. 127)

- Set the drive assy to "Eject" position.
- Remove the belt (pos.126) on the underside; then free the pin from the sensor print (see section 4.1.10). Lift sensor print part vertically (it is plug and socket connected to the capstan motor print). Move both sections of the sensor print clear of the capstan motor.
- Remove the three capstan motor fixing screws (Fig. 7) and withdraw the capstan motor downward from the drive assy.

The reassembly is carried out in reverse order. Make sure that the capstan is free of grease.

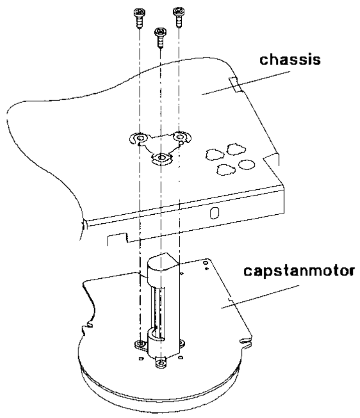


Fig. 7

4.1.7 Pressure roller (Pos. 37)

- Set the drive assy to "Eject" position.
- Unhook and remove the pressure roller tension spring.
- Release the pressure roller guide (pos. 41) from the guide in the threading motor holder by pressing the top of the motor guide rearwards and rotating the pressure roller guide assembly clockwise by approximately a quarter of a turn.(See Fig. 8) The pressure roller and guide can now be lifted clear.

Ensure that no grease from the pressure roller guide gets to the capstan or pressure roller.
The reassembly is carried out in reverse order.

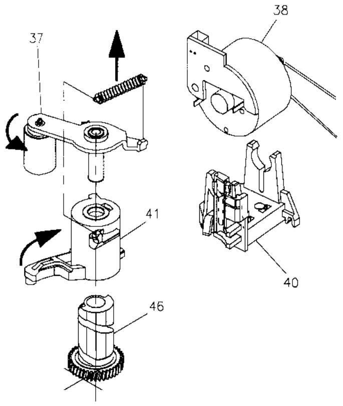
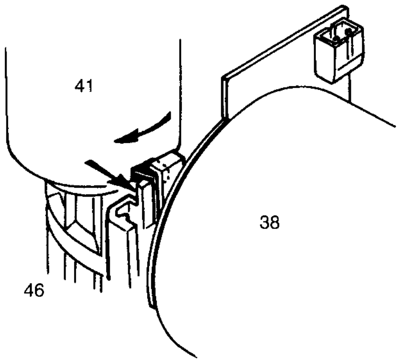


Fig. 8



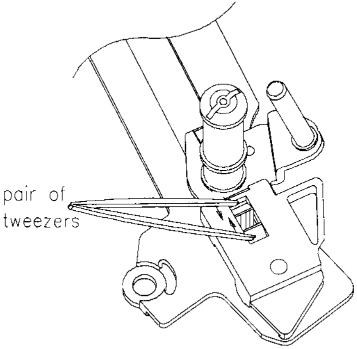
4.1.8 Roller unit right (Pos. 26)

- Set the drive assy to "Eject" position.
- Compress the two snap hooks by means of a pair of tweezers and remove the roller assy from the roller unit right (Fig. 9).
- Unhinge the loading arm right from the holding plate and push the latter towards the front of the deck to remove from the guide (right).

NOTE During reassembly ensure the link from 25B is engaged in the hole of the holder plate 26

After replacing the roller unit (right), the tape path has to be checked, and adjusted if necessary (paragraph 4.2.1).

Fig. 9



4.1.9 Roller unit left (Pos.23)

- Set the drive assy to "Eject" position.
- Unhook the tension arm spring (pos. 11), to avoid the tension arm spring being pre-loaded.
- At the bottom side of the drive assy, partially unhinge the sensor mounting print and remove the tension lever (pos.112).
- Compress the two snap hooks by means of a pair of tweezers (Fig. 9)and remove the roller assy (A) from the plate (B).
- Unhinge the loading arm (left) from the holding plate and remove the latter downward from the drive assy through the recess in the chassis (Fig. 10).

The reassembly is carried out in reverse order.

NOTE: During reassembly
1. Place the carriage holding plate in the assembly with the half-round cutout nearest the rear of the deck.
2. When the loading arm is refitted ensure the pin on the underside of 23 is through the link of 24B.

After replacing the roller unit (left) the tape path has to be checked (paragraph 4.2.1.), and adjusted if necessary.

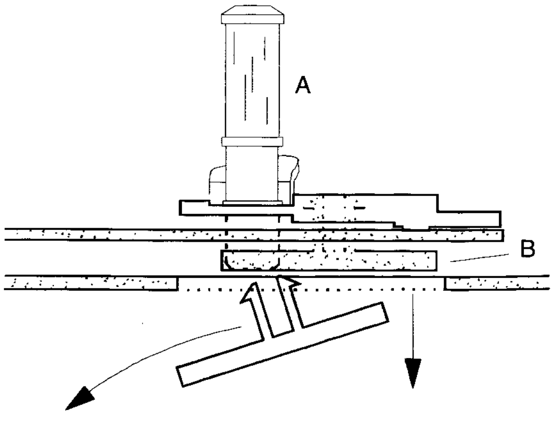


Fig. 10

4.1.10 Sensor print assy (Pos. 118)

For circuit diagram and electrical data see deck electronics (chapter 3).
If a part of the sensor print is defective the whole sensorprint has to be replaced.
Proceed as follows:

- Remove the deck assembly from the set.
- Lift the sensor print vertically, it is plug and socket connected to the capstan motor print.
- All other parts are attached by means of snap hooks and are easily freed.

Reassembly is carried out by snapping the snap hooks into place, and inserting the rivet B.

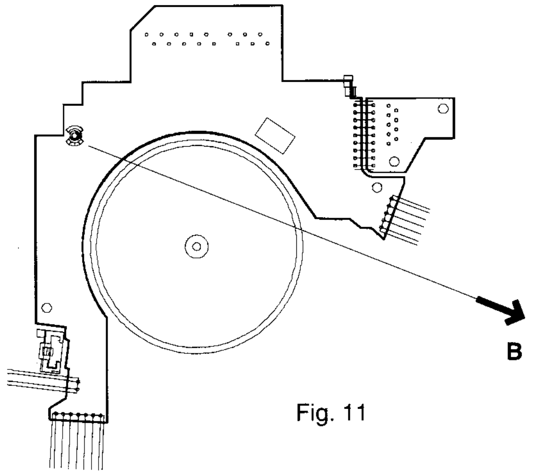


Fig. 11

4.2 Adjustments

4.2.1 Tape path

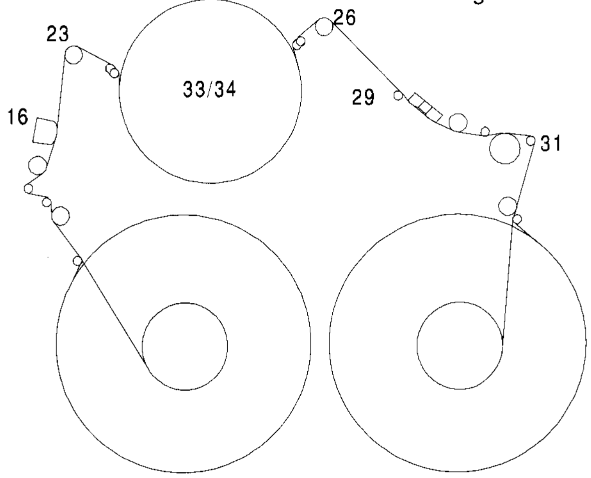

23
26
16
33/34
29
31

Fig. 12

4.2.1.1 Roller left unit/roller unit right

Preparation:

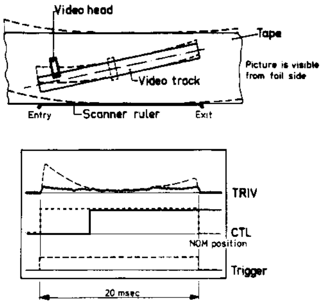
- Connect one input of a dual trace oscilloscope to observe the tape sync pulse CTL.The other input (DC coupled) to observe the tracking information TRIV.
- Trigger the oscilloscope externally on the head pulse HP1.
- Playback the black and white section of the alignment test tape.
- Set the deck in the condition where the video heads are running along the upper edge of the tracks only by:

1. Pressing the auto tracking button and watch the tape sync pulse move to the left in relation to the TRIV signal.
2. Note the extreme left hand position reached by the sync pulse, repeat as necessary.
3. Stop the movement of the pulse when the TRIV signal reduces to 1/2 to 2/3 maximum amplitude by pressing the normal play button. A noisy picture (disturbances) is visible on the TV set and the CTL pulse should be to the left of the display.

The machine will retain this position in memory until an eject is carried out. This condition works only if X-distance is adjusted.

Adjustment:
Adjust the left and right roller units to make the tracking signal TRIV straight and flat as possible (Fig. 13).

Fig. 13


Video head
Tape
Picture is visible from foil side
Video track
Entry
Scanner ruler
Exit
TRIV
CTL
NOM position
Trigger
20 msec

4.2.1.2 A/C Combi head

Tilt angle adjustment

- Set the drive to feature mode (e.g. +7)
- By means of the tilt angle adjusting screw move the tape until the lower edge just touches the tape guide A1 (see Fig. 14) the tape must not be distorted at the lower edge (by pressing onto guide).

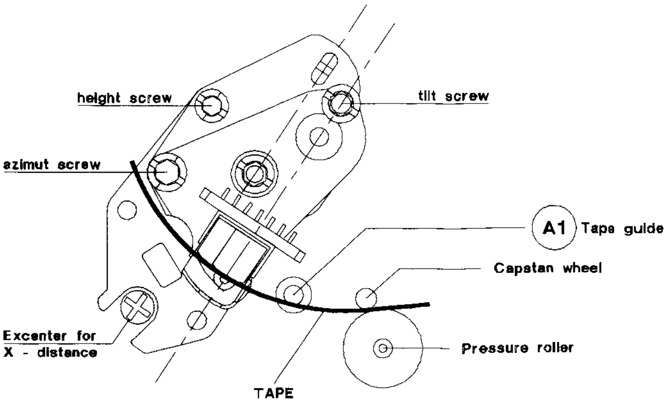

height screw
tilt screw
azimut screw
A1 Tape guide
Capstan wheel
Excenter for X - distance
Pressure roller
TAPE

Fig. 14

Adjustment of the azimuth angle and the head height

- Connect an oscilloscope to the linear Audio output.
- Play the section of the test cassette with the audio signal 400 Hz.
- Adjust for maximum output voltage by means of the height adjustment screw
- Play the section of the test cassette with the audio signal 8 kHz.
- Adjust to maximum output voltage by means of the azimuth adjustment screw (Fig. 14).
- If necessary, repeat this procedure
- Check the tilt angle adjustment

If the tape path was completely out of adjustment or if several components in the tape path have been replaced, it is possible, that the adjustments described in paragraph 4.2.1.1 and paragraph 4.2.1.2 have to be repeated several times.

4.2.2 Adjustment of the horizontal distance (x distance)

- Before this adjustment is carried out, insert the test cassette (start from Eject position). Call the service test program (tracking value will take up its nominal position) and press the "play" button.
- Playback the black/white part of the test cassette.)
- Display the TRIV signal on an oscilloscope (DC-coupled) and adjust for maximum voltage by means of the eccentric screw (Fig.14).

4.2.3 Brake band adjustment

- Set the drive to "Play"
- Adjust the brake band by means of adjusting tool (from the underside of the drive), until the edge of the elbow of the tape tension arm overlaps with the left inner edge of the left guide by 0.5mm (see Fig. 15)

4.2.4 Tape tension adjustment

- Play a VCR cassette (E 180) starting from the beginning of the tape.
- Measure the tape tension before the roller unit left by means of a tentelometer.
- Adjust the tension arm spring (pos.11) to a tape tension of 0,24 N ± 0,02 N (24 g ±2 g) by means of the adjustment tool (from the underside of the drive, Fig. 15).

4.2.5 Friction clutch control check

- Set the drive to "Play" position.
- Place the torquemeter on the right reel.
- Turn the capstan motor to move the right reel clockwise.
- Keep turning, until the indication at the torquemeter no longer changes (Fig. 16)
- The torque has to be 10,5 mNm ± 25% (105gFcm ±25%)

4.2.6 Reverse brake control

- Set the drive to "Reverse" position.
- Place a torquemeter on the right reel and turn the latter counterclockwise, until the reel just starts to flip.
- The value indicated at the torquemeter has to be 7mNm± 3mNm (70 gFcm ± 30gFcm) (Fig. 16).

Fig. 15

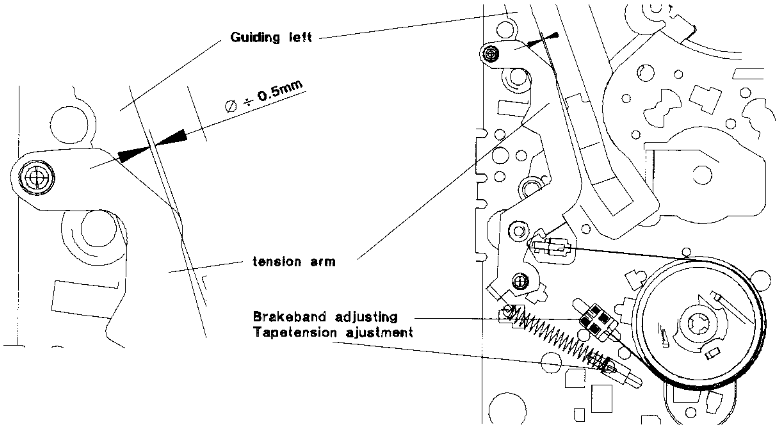
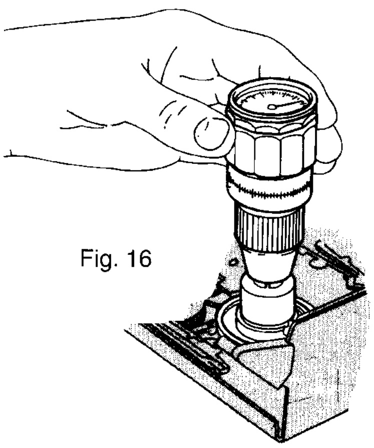
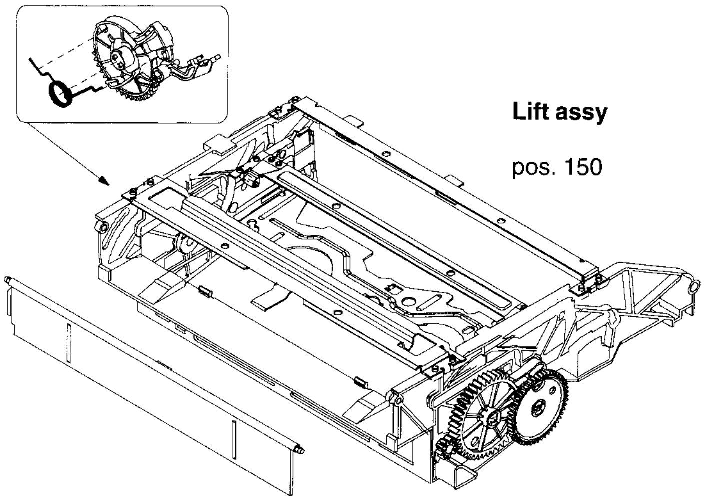


Fig. 16



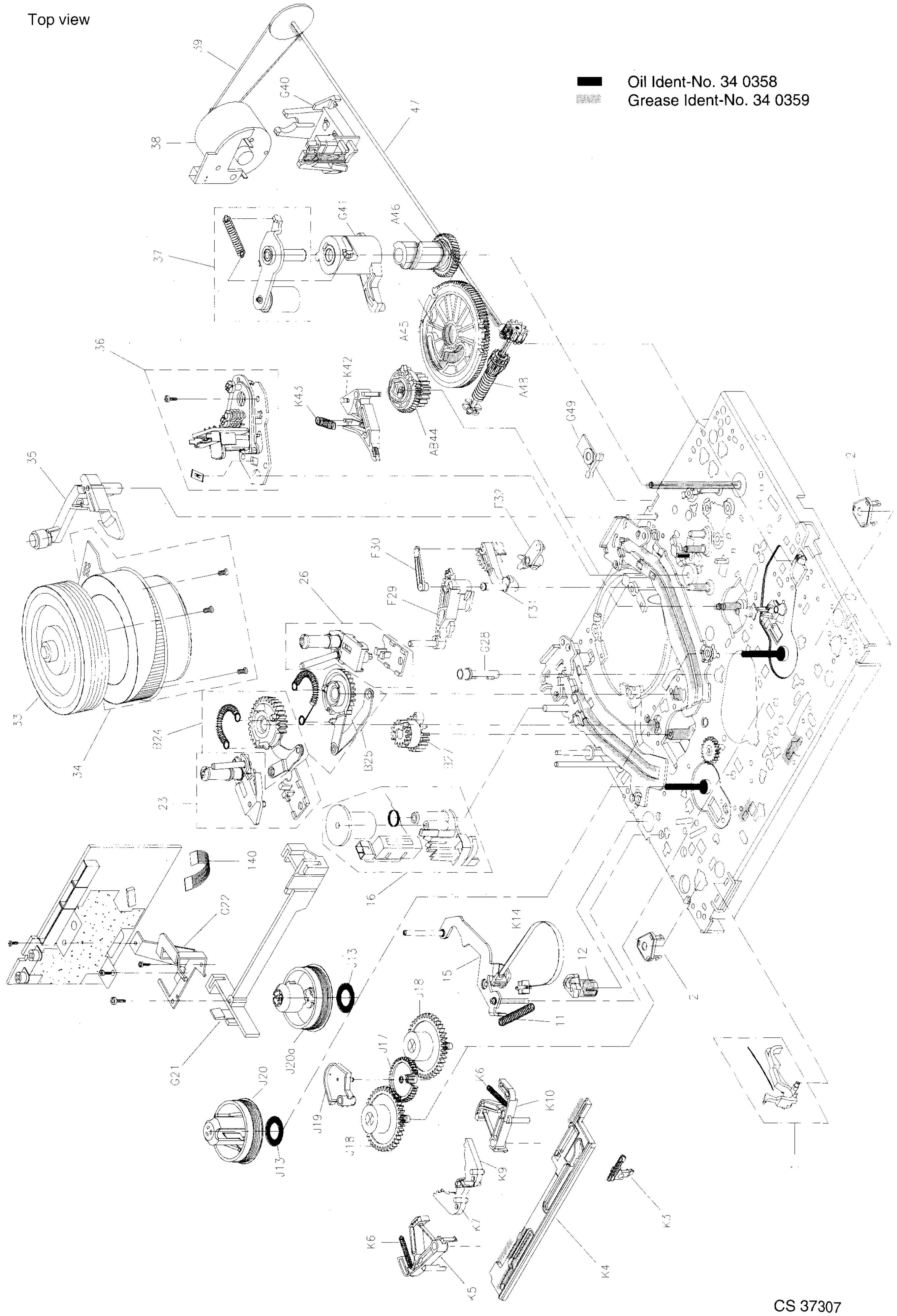


Lift assy

pos. 150

4.3 Exploded view

Top view

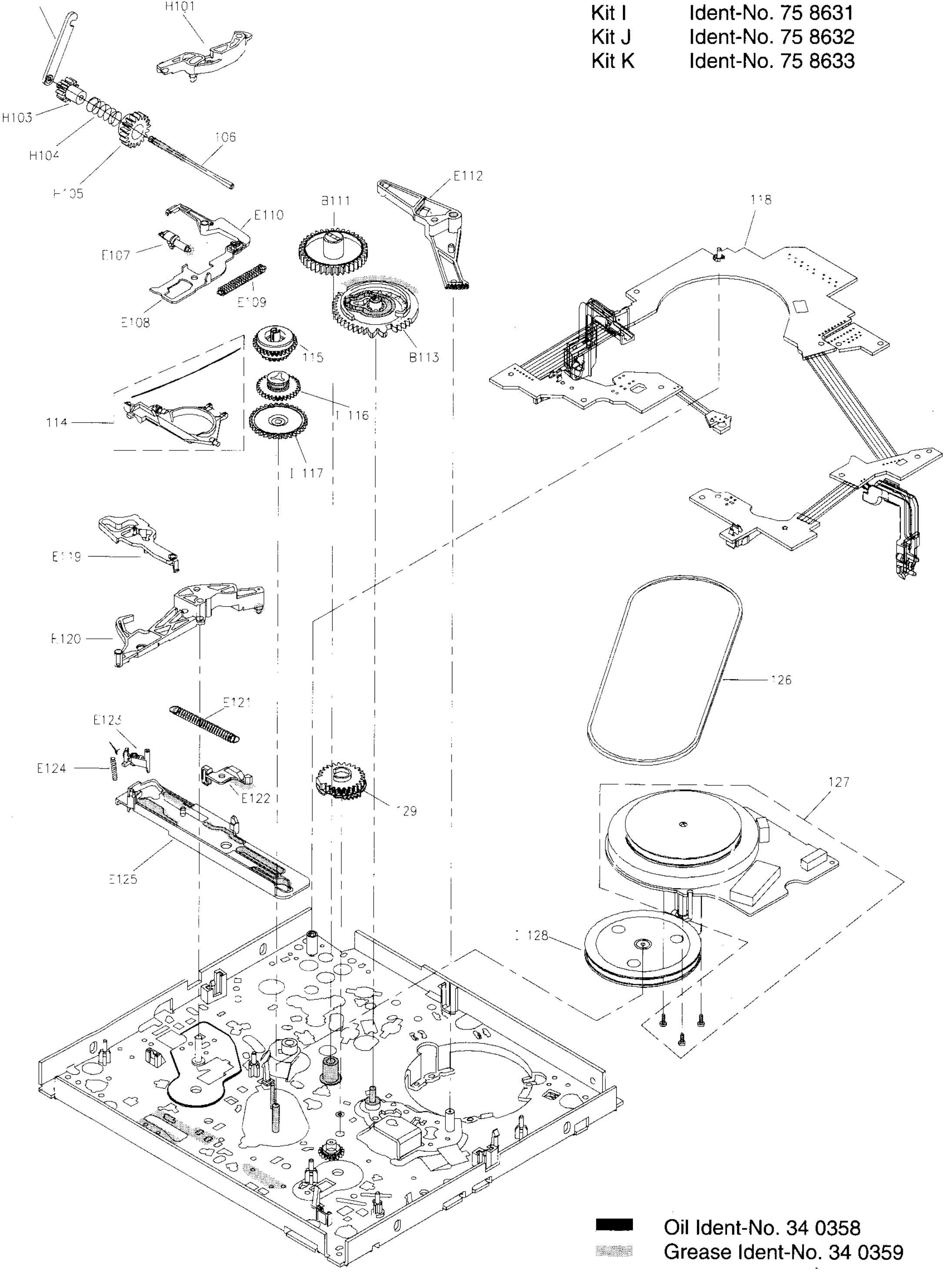

39
G40
47
38
A46
G41
37
A45
36
K42
K43
A43
A344
G49
35
2
F32
F30
26
F29
F31
G28
33
B24
B25
B27
34
23
140
16
G22
K14
12
J13
15
J18
11
2
G21
J20a
J17
J20
J19
K6
K10
J18
J13
K9
K7
K3
K6
K5
K4

■ Oil Ident-No. 34 0358

▨ Grease Ident-No. 34 0359

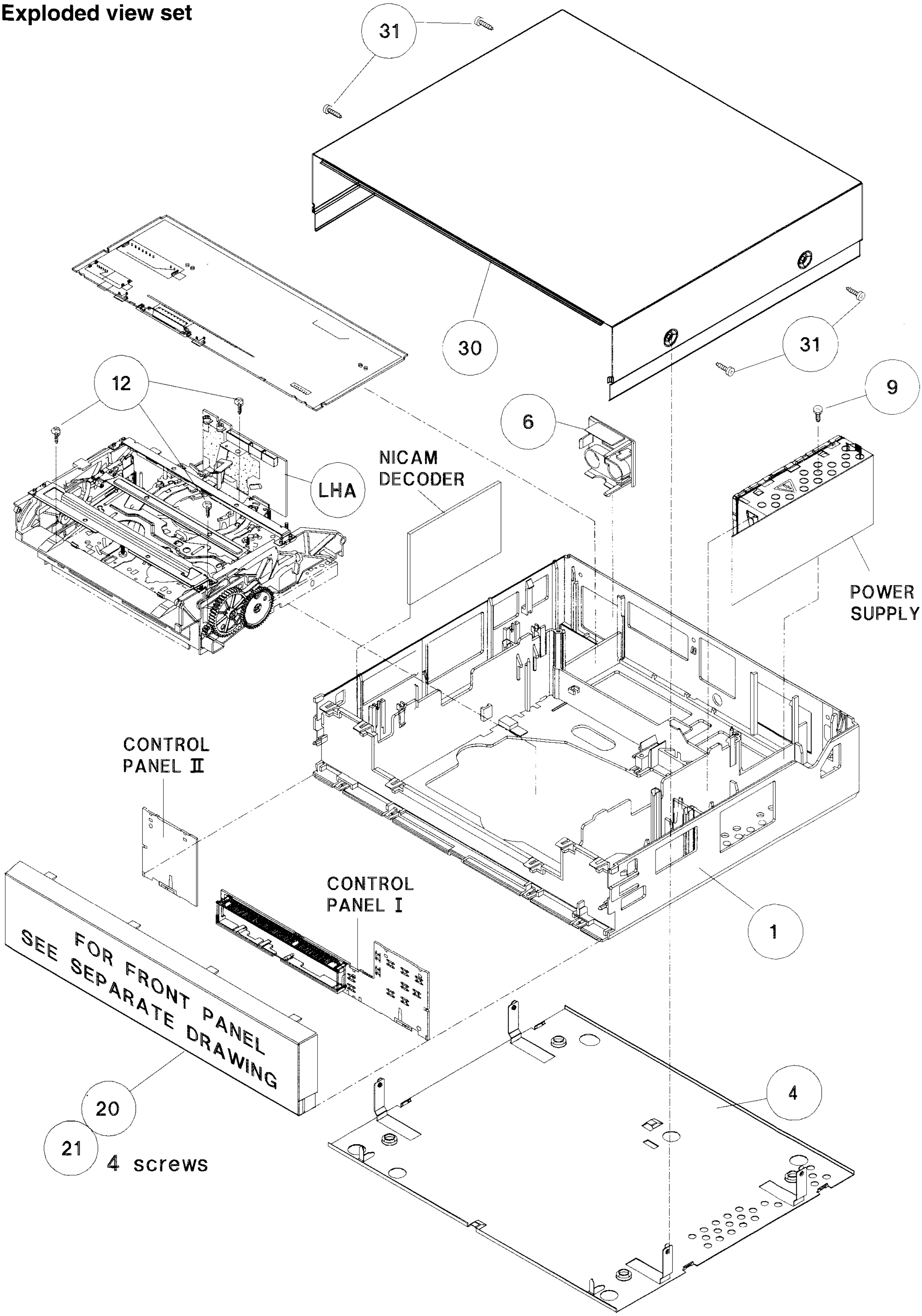
To ensure reliable repairs a number of kits have been developed. These kits contain all essential service parts which are mutually engaged. A kit is identified in the exploded views by way of a letter in front of the relevant item number, e.g. E112 for kit E. All parts which have an E before the item number, as in this example, are available in kit E as a replacement part. Following kits are available:

Kit A	Ident-No. 75 8625
Kit B	Ident-No. 75 8626
Kit E	Ident-No. 75 8627
Kit F	Ident-No. 75 8628
Kit G	Ident-No. 75 8629
Kit H	Ident-No. 75 8630
Kit I	Ident-No. 75 8631
Kit J	Ident-No. 75 8632
Kit K	Ident-No. 75 8633


H102
H101
H103
H104
H105
106
E112
B111
E110
E107
E109
E108
118
B113
115
114
I 116
I 117
E119
E120
E121
E123
E124
E122
129
E125
126
127
I 128

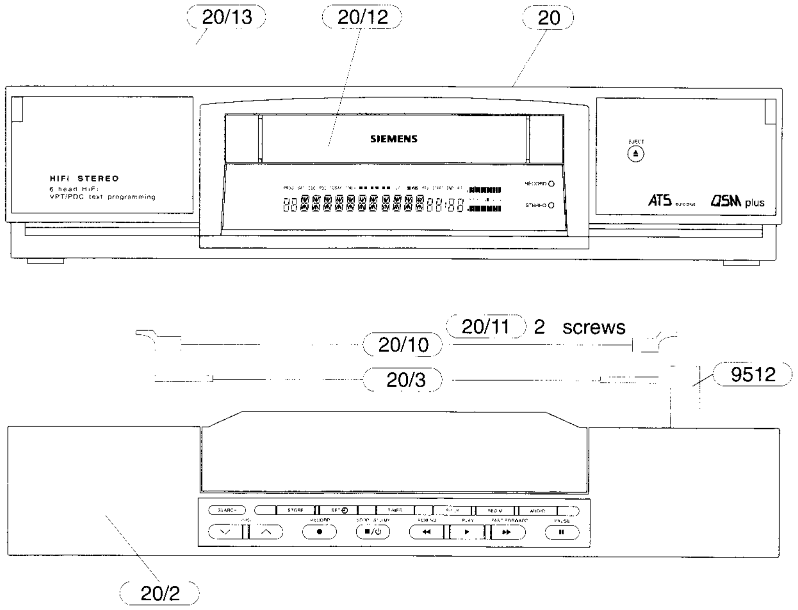
■ Oil Ident-No. 34 0358
▨ Grease Ident-No. 34 0359

Exploded view set

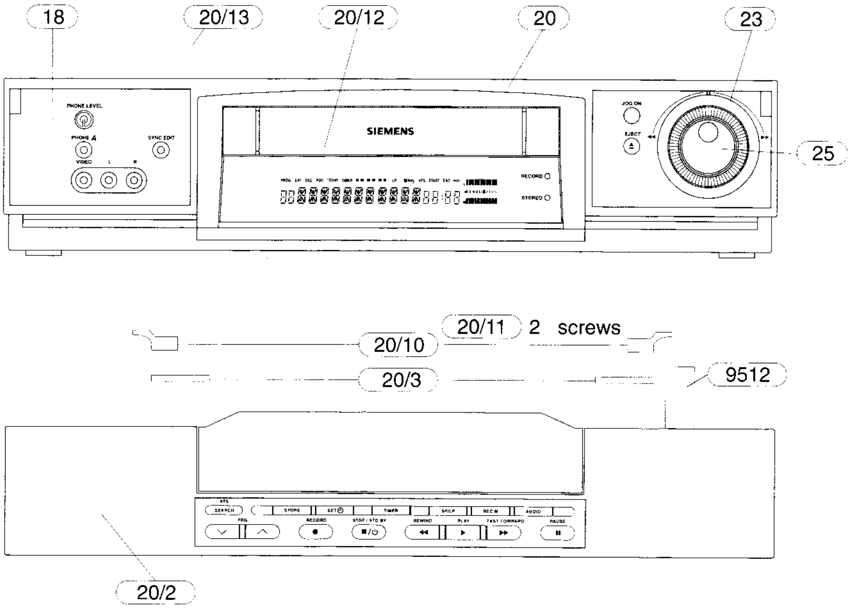

31
30
12
LHA
NICAM
DECODER
6
31
9
POWER
SUPPLY
CONTROL
PANEL II
CONTROL
PANEL I
1
FOR FRONT PANEL
SEE SEPARATE DRAWING
20
21
4 screws
4

Front panel

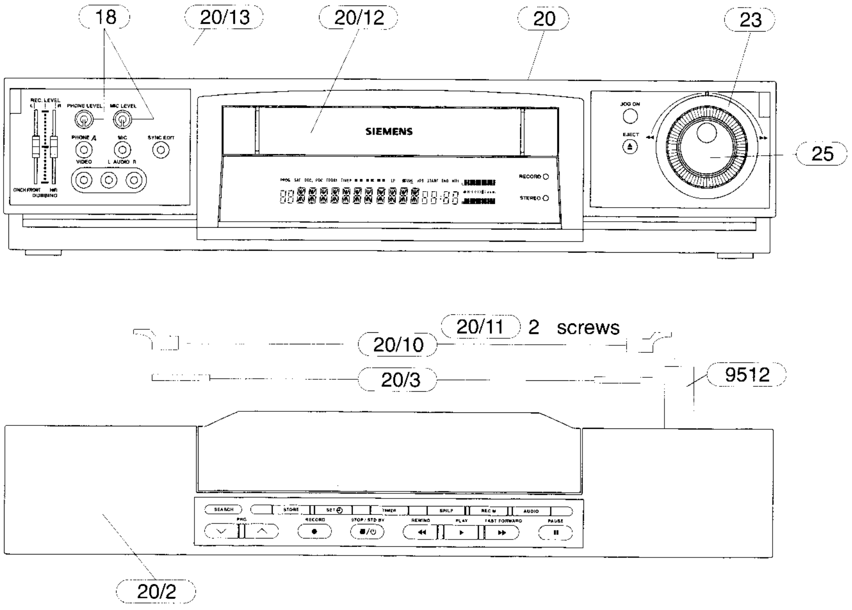
FM 726


20/13
20/12
20
SIEMENS
HiFi STEREO
6 head HiFi
VPT/PDC text programming
EJECT
ATS
QSM plus
RECORD
STEREO
20/11 2 screws
20/10
20/3
9512
20/2

FM 727


18
20/13
20/12
20
23
PHONE LEVEL
PHONE
SYNC EDIT
VIDEO
L
R
SIEMENS
RECORD
STEREO
JOG ON
EJECT
25
20/11 2 screws
20/10
20/3
9512
ATS
SEARCH
STORE
TIMER
REC M
AUDIO
PRG.
RECORD
STOP / STD BY
REWIND
PLAY
FAST FORWARD
PAUSE
20/2

FM 728


18
20/13
20/12
20
23
REC. LEVEL
L
R
PHONE LEVEL
MIC LEVEL
PHONE
MIC
SYNC EDIT
VIDEO
L AUDIO R
DUBBING
SIEMENS
RECORD
STEREO
JOG ON
EJECT
25
20/11 2 screws
20/10
20/3
9512
SEARCH
STORE
TIMER
REC M
AUDIO
PRG.
RECORD
STOP / STD BY
REWIND
PLAY
FAST FORWARD
PAUSE
20/2